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Blockchain for the Automotive Industry

What is Blockchain Technology?

Blockchain is a distributed digital ledger which records events in blocks and secures them using cryptographic techniques. Each block is sequentially linked to another block which results in a chain of blocks. This is where the name is derived from. An event could be a transaction, a data entry or even the execution of a software program. Once an event is added to a block, it becomes permanent and can be verified by all participants having access to the blockchain. The distributed nature of blockchains and the associated cryptographic techniques to validate individual blocks make them vastly more secure than any existing security system.

The most popular implementation of blockchain today is bitcoin. This is however just the starting point and blockchain can be used for a variety of applications. The second most popular application of blockchains are smart contracts which are basically computer code recorded in blocks which is executed once certain preconditions are triggered. A simple analogy to smart contracts is how vending machines work. The machine accepts money and is programmed to dispense the selected item. There is no third party involved. In the case of smart contracts, the computer code accepts an asset or a cryptocurrency as the input and executes the computer code as per the defined preconditions.

This article presents the disruptive potential of blockchain technology and outlines possible use cases for the automotive industry.

The Disruptive Potential of Blockchain

Blockchain technologies have already started to impact the finance industry and organizations across industries are recognizing the benefits of this disruptive technology. Some of the most obvious applications of blockchain technologies are their use in shared information records, transferring digital assets and applications built using smart contracts. Smart contracts are an ideal use

to program business logic and operations. This automates existing processes and increases transparency for interacting parties. Parties do not need to rely on central authorities or service providers. Many necessary intermediaries in the current business scenario such as administrations, associations, banks and notaries can be made redundant using this technology. This directly leads to significant cost and time savings and offers exciting opportunities for organizations to build future business models.

Adoption of Blockchain

Given the hype and potential surrounding blockchain technology, it is tempting to assume that mainstream adoption is around the corner. The famous quote about technology - "we tend to overestimate the impact of a technology in the short run and underestimate its impact in the long run" is very much applicable to blockchain. From a technological standpoint, blockchains are as revolutionary as the internet and can arguably eclipse every other technology shift to date. Just as internet adoption took more than a decade to be adopted by the vast majority, blockchain adoption will take time and the pace of adoption will vary across industries. It is very encouraging to see many organizations and industry groups experimenting and piloting projects with the technology today. In order to assess the near-term potential, it is important to analyze existing IT and business processes and have a clear understanding of business and functional requirements.

How to Evaluate a Good Use Case for Blockchain

The inherent properties of blockchain technology make it ideal for applications across the industry spectrum. Here are some key criteria to evaluate if using blockchain technology adds business value and/or reduces costs. The more criteria apply to a use case, the more business potential is unlocked:

- Several participants or organizations share a common data record
- A single source of truth is needed for record keeping
- Processes have been digitalized but not necessarily automated

- Reducing intermediaries minimizes cost and complexity
- Trust is needed to conduct business or there is a cost associated with achieving appropriate trust levels
- Transparency is needed but privacy and confidentiality need to be preserved

Three Types of Blockchain

There are basically three types of blockchain systems that differ based on the number of participants and their permission rights, methods to reach consensus and transaction speed.

Public Blockchain

A public blockchain is a blockchain that anyone in the world has access to. In addition, anyone can submit a new entry to this blockchain and get it recorded.

Public blockchains are backed by economic incentives and cryptographic verification. Here, methods such as "proof of work" are applied. Due to the extremely redundant data storage in public blockchains, transactions are associated with relatively high costs. A transaction on the bitcoin blockchain currently costs between 10 Cents and 20 Euros.

Private Blockchain

A private blockchain is a blockchain in which the permission to record entries is centralized within one organization. Permissions to view entries may be shared publicly or restricted to certain parties within a business network. Possible applications for this are internal database management or auditing for a single organization. Access outside the organization is thus not necessary in many cases, although in some cases, public auditing can be made possible. Private blockchain transactions are fast and incur low to no transaction costs.

Consortium Blockchain

A consortium blockchain is a blockchain in which the consensus process is controlled by a defined set of nodes. For example, imagine a group of ten organizations within an industry. For a transaction to be valid,

at least seven organizations would need provide their confirmation.

What is the Right Type of Blockchain?

There is no one size fits all and the type of blockchain depends on the business needs and goals. There are trade-offs with every type of blockchain. Public blockchains due to their open and decentralized nature reduce the burden of trust, but have the disadvantage of low scalability and high transaction costs. Private blockchains are fast and cost efficient but have the disadvantage of their centralized nature. Here are four key considerations in choosing the right type of blockchain:

1. Which parties are permitted to record entries and which parties are permitted access to these records?
2. What is the governance mechanism i.e. how do the parties reach consensus?
3. Does business data, metadata or identities of the interacting parties need to be kept confidential?
4. Is the speed of processing transactions critical?

Blockchain Transforming the Automotive Supply Chain and Beyond

The automotive supply chain is a highly complex and broad ecosystem with participants ranging from parts suppliers, manufacturers, sellers to aftermarket suppliers. Disruptive potential of the blockchain technology for the automotive industry is immense, however it is not a cure-all to solve business problems. In order to deliver real customer value, existing IT and business processes need to be analyzed and solutions need to be designed keeping in mind core concepts such as security, confidentiality and authorization permissions. Here several use cases are presented where blockchain technology provides increased transparency across the supply chain and significantly reduces the cost and complexity of doing business with multiple parties. For automakers and suppliers, blockchain technology offers unique benefits starting with protecting their brands from counterfeit products to enhancing their brand experience by creating customer-centric business models.

Figure 1 Automotive Supply Chain

Identification and Tracking of Automotive Spare Parts

Counterfeit Protection – Verifying Authenticity and Origin

Counterfeit products are a significant issue for automotive manufacturers / suppliers and the counterfeit spare parts market is currently estimated at several billion dollars. Counterfeit products enter the supply chain directly or through online channels and impact both OEMs (Original Equipment Manufacturer) and aftermarket suppliers. Counterfeit spare parts are often of low quality and thus more likely to fail. This leads to dissatisfied customers and trust in the brand is impacted. Especially in the case of vintage cars, a counterfeit spare part can significantly impact the car value. Currently solutions are available in market which provide some level of protection. Individual QR codes or hologram labels are printed on the product packaging to differentiate original products. These solutions are however inadequate as these can be copied by sophisticated attackers. Blockchain technology brings significant advantages over existing solutions where spare parts can be uniquely identified and digitally represented. The digital identification of these parts can be shared transparently to multiple parties in the blockchain business network. Governance models can be agreed within the business network on which parties have visibility to which information. A mutual collaboration is facilitated within the parties knowing that sensitive business information remains confidential. Confidentiality is enforced through blockchain cryptographic methods not only from manipulators within the business network but also externally from attackers. A spare parts service center for instance can accurately verify the authenticity of a part during replacement. The immutability of blockchain provides for a tamper proof solution and offers a single source of truth. Customers ultimately benefit through fewer disruptions and the trust relationship with the manufacturer is enhanced.

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Protection of Aftermarket Business

The global aftermarket business was valued at over 600 billion USD in 2016[1] and expected to grow to over a trillion USD over the next 10 years. Over 50% of this market consists of the sale of vehicle spare parts and business is split across OEM (Original Equipment Manufacturer) and IAM (Independent After Market) Suppliers. In some cases, OEMs source the product from suppliers and the same product is available under different brands through shared distribution channels. Agreements are entered between the manufacturers and suppliers on the volume of the spare parts that can be produced. As each product or part is uniquely represented on the blockchain, the technology can be applied to enforce business terms related to the exact production volume and timing. This level of enforcement can also be applied for manufacturers working with more than one supplier as part of their dual sourcing strategy.

Spare Parts Liability Resolution

In case a spare part needs to be replaced due to failure, liability needs to be established and this requires tracing the part back to the manufacturer. If parts are identified and digitally represented on the blockchain, it offers an accurate way to trace the origin. Liability is thus clearly established and is transparent to all parties in the blockchain. Any liability disputes can be resolved much faster and resources can be focused on customer engagement.

Vehicle Recall Optimization

In 2016, over 53 million vehicles were recalled in the United States market alone. [2] This is a staggering number with recall costs reaching into the billions of dollars for automakers. Many of the recalls involve product defects that are life-threatening and automakers are exposed to a huge liability. With blockchain technology the car and the individual assembled parts can be uniquely represented on the blockchain. If automakers have accurate visibility on which defective parts were installed in which cars, then the scope of the recall can be precisely executed. This will result in massive cost savings for the manufacturer. Customers are informed much faster if their vehicles are affected and brand loyalty is strengthened.

Optimizing the Supply Chain Process

Inbound Logistics and Smart Manufacturing

The efficient planning of production capacity requires the manufacturing plant to coordinate between multi-tier suppliers, 3rd party logistics and transportation companies. Tracking and tracing individual parts across the inbound supply chain is complex and error-prone. Accurate, real-time information is not available and information is spread across individual databases. By using a distributed immutable blockchain ledger across all parties, an accurate view of the status, quantity and location of the individual parts can be established. This granular visibility can improve real-time logistics and plant production capacity.

Outbound Logistics Planning

The outbound supply chain in the automotive sector consists of a complex network of manufacturers, distributors, importers and dealers. Similar to the inbound supply chain, participants in the outbound supply chain do not have a common data sharing model. Having a shared blockchain based system across the different participants will offer transparency and

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[1]   https://www.prnewswire.com/news-releases/global-automotive-aftermarket-products-market-report-2016-2017--2022---research-and-markets-300434964.html

[2] https://www.reuters.com/article/us-usa-autos-recall/u-s-auto-recalls-hit-record-high-53-2-million-in-2016-idUSKBN16H27A

visibility. This will ensure faster transactions by lowering settlement periods.

Business Model Innovation

Car Personalization and Customer Engagement

The sharing economy has disrupted many industries and the automotive industry is no stranger to this shift. Consumers are showing a preference toward shared mobility but at the same time expect a personalized service. Driver profile along with car customization preferences can be saved in a personal blockchain wallet. Shared or lease cars will authenticate the driver using the wallet and the car settings are personalized based on the driver profile. Automakers and mobility operators can thus create new business models focusing on individual preferences.

Dynamic Pricing Models in Automotive Insurance and Leasing

Disruptive trends are emerging in the insurance industry and insurance providers are experimenting with dynamic pricing models. A driver profile including miles covered, economical usage of vehicle and accident history is securely stored on the blockchain. Users share this data with providers offering insurance and leasing products based on their personal driving profile. The advantage that blockchain technology brings here is that the driver profile and historic events are immutably stored on the blockchain providing a single source of truth. Providers can rely on this single source of truth for offering personalized products with dynamic pricing. Users have access to better priced products and get incentivized for good driving behavior.

Digital Car Wallet

Ownership history, maintenance and repairs can be transparently and verifiably stored in a blockchain based car wallet. Ownership record and fair price assessment of second hand cars can be quickly established and transferring ownership can be done faster. As vehicles are uniquely identified on the blockchain, stolen cars can be easily tracked and traced. Lack of trust and business friction arising in the transfer of ownership is hugely reduced. If repairs and parts replacements are verifiably tracked on the blockchain, warranty claims will be transparent for all parties.

Car-to-Infrastructure Transactions

Blockchain technology offers a unique way to automate transactions between machines and enable the future of M2M commerce. Cars in the future will be equipped with blockchain based wallets and transactions with toll booths, park stations and electric charging outlets will be automated without manual intervention.

Summary

The inherent properties of blockchain technology are ideally suited to reducing business friction and increasing trust among organizations across the automotive supply chain. Collaboration and communication among the participants in the supply chain are vastly improved through shared processes and record keeping. In the near-term, the technology is ready to be deployed by manufacturers and suppliers to protect their brands against counterfeit products and also achieve significant cost savings through supply chain process improvements. In the mid- to long-term automakers and mobility providers can drive business model innovation by building user-centric mobility products. Marketing and branding efforts can be concentrated on these products ultimately enhancing and strengthening customer engagement.

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