

Automotive Digital 2 : Blockchain and Smart Contracts

Blockchain Video credit to Centre for International Governance Innovation; Smart Contracts video credit to Smartbridge.

Why Auto-OEM's sudden interest in Blockchain?

In 2017 Daimler AG reported their first use of blockchain technology to execute a financial transaction. Daimler and Landesbank Baden-Württemberg (LBBW) successfully launched a €100 million 1 year corporate loan placed privately. The entire transaction — from the origination, distribution, allocation and execution of the loan agreement to the confirmation of repayment and interest payments — was carried out digitally via blockchain technology in cooperation with the IT subsidiaries TSS (Daimler) and Targens (LBBW). The following year, in 2018, Daimler set up the Daimler Mobility Blockchain Factory. In 2019 Daimler announced a pilot to use the Daimler Truck Wallet to make payments with e-euros from Commerzbank through Commerzbank's 'Corda' blockchain. Once the e-euros are used for payments, the recipient can request Commerzbank to convert the digital cash back to its bank account. Daimler believes it could end fuel-card scams forever.

In 2018 BMW, Ford, Renault and GM became founder members of MOBI - the 'Mobility Open Blockchain Initiative' - a consortium of carmakers, mobility, energy and infrastructure providers exploring uses of blockchain. BMW see the use of blockchain concepts such as 'VerifyCar' as a cure for vehicle history and mileage fraud. They also see it as a way of elbowing digital giants aside from total control of big data.

But, attempts by individual car-makers to carve out a protected niche for themselves misses the impact of blockchain technology. Blockchain makes the existing business and financial system redundant. It has the potential to make existing methods of designing, building, buying and selling everything redundant. Not just financial instruments, shares and bonds but, when integrated with Expert Systems, it has the potential to be the secure repository of all forms of intellectual property. Expert systems are the computer applications developed to solve complex problems in a particular domain, at the level of extra-ordinary human intelligence and expertise.

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What is Blockchain?

First, blockchain is a distributed ledger technology. It provides a stand-alone and secure data structure solution. Auto OEM's recognise that it can resolve many challenges facing vehicle manufacturers, distributors, fleet managers and vehicle owners.

What is a Distributed Ledger?

In the simplest terms, a blockchain is a distributed ledger. Its like a book of accounts that is replicated hundreds of times, each copy held in a separate, secure vault. That is, it's a shared database that exists on multiple computers across a distributed network. To function properly distributed ledger technology includes superior data encryption methods. However, its core is a database architecture named blockchain. Blockchain technology has the following unique

characteristics:

it's a peer-to-peer structure, rather than a client-server arrangement. No-one has absolute control of the data

the ledger is composed of blocks, which are simply transaction records.

blocks contain contents and an identifying header.

each block is time-stamped.

each block is linked to the preceding and following blocks, forming a blockchain.

a distributed network of computers is used to reach a consensus on whether or not a transaction is valid.

once added to the chain, blocks cannot be altered.

public and private keys are used to prevent unauthorized access to data.

In short, a blockchain is a type of shared database with high security.

Advantages of Blockchain

Blockchain offers the automotive industry a wealth of advantages over other technologies:

unparalleled security.

execution speed.

transparency.

cost reduction through eliminating intermediaries.

ability to audit records.

versatility.

How can we use Blockchain?

Blockchain technology is an inherently secure means of storing and sharing data. The data structure of shared ledgers makes adding to, removing, or altering data nearly impossible once it has been validated and stored in a block. Not only does the blockchain structure prevent data hacking, but the encryption of data and block data signatures adds another layer of protection. By "hashing" the data using 256-bit *strong encryption*, the odds of a hacker accessing data stored in a blockchain without possession of a unique *private key* are truly astronomical.

What is an Expert System?

An expert system is computer **software** that attempts to **act like a human expert** on a particular **subject area**.

Expert systems are often used to **advise non-experts** in situations where a human expert is unavailable (for example it may be too expensive to employ a human expert, or it might be difficult to reach location).

How Do Expert Systems Work?

An expert system is made up of three parts:

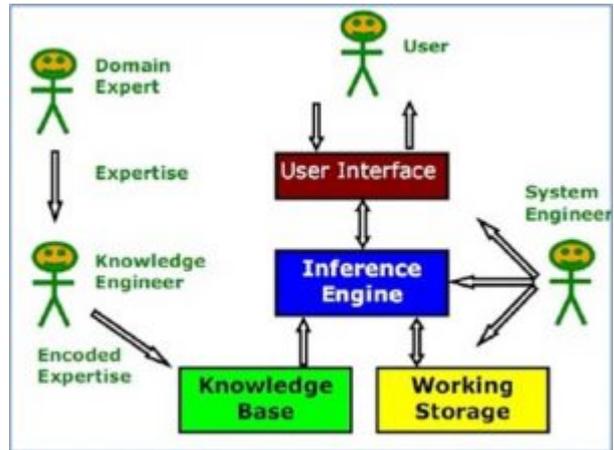
A **user interface** - This is the system that allows a **non-expert user** to **query** (question) the expert system, and to **receive advice**. The user-interface is designed to be a **simple** to use as possible.

A **knowledge base** - This is a **collection of facts and rules**. The knowledge base is created from **information** provided by **human experts**

An **inference engine** - This acts rather like a **search engine**, examining the knowledge base for information that **matches** the user's **query**

Because of these security features Blockchain technology offers a range of use opportunities lower than current costs. For example, vehicle ownership, service and financial data can all be linked for a specific vehicle and made available to verified parties digitally. Full service history would be available to any authorised user. So would engine condition, accident damage, fuel use, insurance and ownership status. Add to that all the telematics data. Its location, speed, driver id and road behaviour. The vehicle data would be available anywhere, anytime to any authorised user. All the data would be tamper-proof. The cost and speed of accessing the data would be near-zero and its availability would be in real-time. No more mileage record tampering, car sales fraud, unreported accidents or thefts, to name just a few.

Blockchains are said to be designed to store vehicle data, its future and many other types of commodities, as well. Blockchains can store contracts and those contracts, whether for cars, land, commodities and services can be automatically executed. The ability to embed contracts with other data, such as invoices, makes the technology ideally suited across the entire automotive industry and beyond.



If Blockchain is combined with Expert Systems there is the potential for design and other forms of intellectual property to be securely held and activated, via smart contracts, to produce products with no risk to the counterparties, including the designers and producers.

How might Blockchain affect dealers, distributors and their staff?

New and used car sales might be easier. The buyer would have access to a complete driving, collision and service history for the vehicle. But deals would be tighter: buyers might also have access to transaction prices of similar vehicles in real time. In either case, buyers are more likely to transact online because Blockchain could eliminate much of the buyers risk in the vehicle.

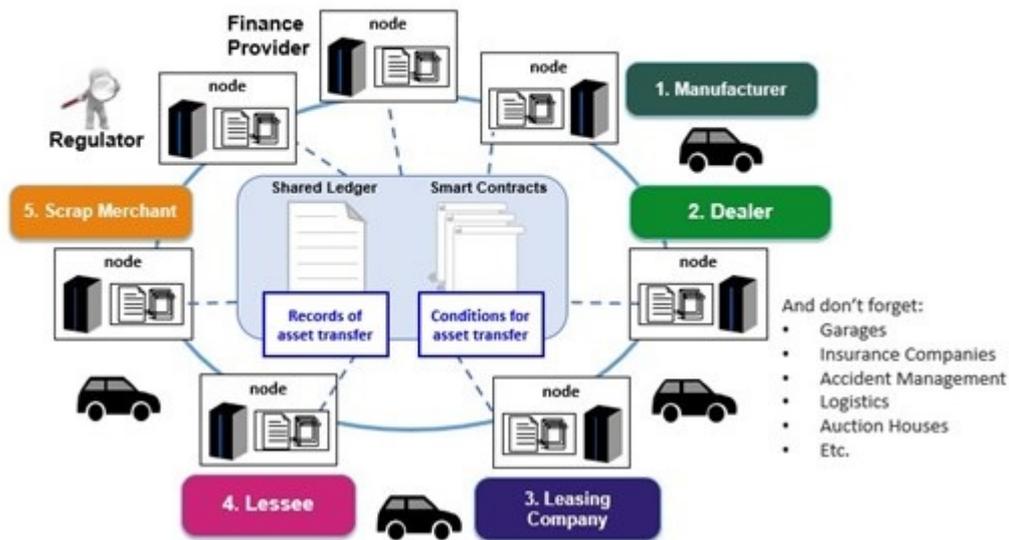
Service income would likely decline. On-board diagnostics would customize maintenance and service marketplaces would push costs down while maintaining warranty conditions. But, mandatory tailpipe emission regulations and vehicle safety standards could be enforced in real time. Regulatory inspection schedules could disappear, but service visits might increase in frequency. In effect, maintenance is automated, minimising the risk of vehicle down-time. Rental and demonstrator fleets would be driven more carefully, because driver behaviour could be recorded, and claims for unexplained ‘workshop scratches and dents’ could almost be eliminated. The vehicle use record could be available for all to see from the blockchain. Debtors could be reduced. Payments could be authorised via the blockchain on pre-agreed conditions. So too, could payment of parking and speeding fines and road tolls. Opportunistic car theft might almost disappear. The blockchain could make the car location transparent and disable the engine and other components from further movement.

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What are ‘Smart Contracts’?

Automotive Retail Lifecycle



A **smart contract** is a computer programme intended to digitally facilitate

ate, verify, or enforce the negotiation or performance of a *contract*. Smart contracts allow the performance of credible transactions without third parties. The blockchain provides the host for smart contracts because it is a decentralized ledger or record system between all permitted parties, without the use or risk of intermediaries.

Smart contracts work by following simple “if/when...then...” statements that are written into code on a blockchain. A network of computers executes the actions (releasing funds to the appropriate parties; registering a vehicle; sending notifications; issuing a ticket) when predetermined conditions have been met and verified. The blockchain is then updated when the transaction is completed.

Take this supply chain example. Buyer B wants to buy something from Seller A, so puts money into an escrow account. Seller A will use Shipper C to deliver the product to Buyer B. When Buyer B receives the item, the money in escrow will be released to Seller A and Shipper C. If Buyer B doesn't receive the shipment by Date D, the money in escrow will be returned. When this transaction is executed, Manufacturer E is notified to create another of the items that was sold to replenish stock. All this is done automatically.

Smart contracts operate like a vending machine. Ordinarily, you would go to a broker, pay them, and wait while you get the service, product or document. With smart contracts, you simply drop an e-coin into the vending machine (i.e. ledger on the Blockchain), and your insurance certificate, driver's license, or whatever drops into your account, or your property, say a car, is delivered to you. More importantly, smart contracts not only define the rules and penalties around an agreement, in the same way that a traditional contract does, but also automatically enforces those obligations. So, smart contracts can help you to exchange money, property, shares, title to vehicles, or anything else of value, in a transparent, conflict-free way while avoiding or minimising the services of a middleman.

The benefits of smart contracts are most apparent in business collaborations, in which they are typically used to enforce some type of agreement so that all participants can be certain of the outcome without the cost or time of an intermediary's involvement. No broker. No dealer.

Leasing companies can deal direct with the lessor. Insurance customers can deal directly with the underwriter. They can be fast, secure, trustworthy and lower cost than traditional methods.

Motor Industry impacts?

No wonder auto-OEM's like smart contracts. Imagine renting or leasing a connected car which had a 'smart lien' protocol inbuilt. The car wouldn't start, if payments were missed, and only a key owned by the finance company starts the car instead. Or, having a car with it's own e-payment account and identity. It could pay for parking, road tolls, EV **charging** and fuel via smart contracts. And, the vehicle may have tamper-proof collision sensors that determine **accident** damage and fault without manual inspection. Or, location sensors for 'pay as you go' driver **insurance**.

Blockchain and smart contract use cases go far beyond individual vehicles. In 2017, Ernst & Young launched **Tesseract**, a blockchain-based integrated mobility platform with transport services ranging from single vehicles to fleets available on the platform. Vehicles and trips are digitally logged on the blockchain and the transactions are automatically settled between owners, operators and third-party service providers through a single-source, usage-based payment system.

DAV Foundation's blockchain-based transportation **platform**, allows vehicles to discover each other, as well as service providers and clients around them. This car and ride sharing platform allows individual and fleet owners to lease their vehicles short-term using smart contracts. An authenticated rider can access the platform through a mobile app which finds available vehicles. A car can be booked and paid for using secure e-payment. The app communicates with the car, allowing the user to unlock the car with just the click of a button. DAV's supporters are OEM heavyweights - MOBI, GM and Toyota, to name just a few. Added to them, IBM, ZF and Bosch are all working on tokens or e-coin systems to take payments, similar to Bitcoin, Ethereum and other crypto-currencies.

Could Blockchain and Smart Contracts provides some light at the end of a tunnel, for dealers as well as OEM's? Mobility platforms don't care who owns or leases a car. You don't have to be Avis or National. You don't need to be big. You just need to be on the platform. There may still be niches left for the adventurous.

Interested in knowing more? See the next post on Big Data and Edge Computing.