

Deloitte.



**Accelerating technology disruption
in the automotive market**

Blockchain in the automotive industry

Contents

1. Executive summary	01
2. Auto disruption and the role of blockchain	02
3. Practical applications of blockchain within automotive	06
4. Assessing blockchain opportunities	10
5. Responding to blockchain	12
6. Annex: Assessment framework and method	14
7. Contacts	17
8. Endnotes	18



1. Executive summary

The automotive market of the future will be starkly different from that of today. It will need to be more integrated and offer on-demand and personalised services that will include autonomous, shared and connected cars. Blockchain has the potential to play a major role in underpinning the industry transformation that is coming.

Blockchain is the technology that underpins bitcoin and other cryptocurrencies but is also much more than that. There are many opportunities to use blockchain across the automotive industry that can transform products, services and processes. It provides an innovative approach to managing data and executing transactions where accuracy and reliability is paramount, car financing being just one example.

Our discussions with executives across the industry reveal that many businesses are keen to understand and apply blockchain but are unsure of where to start. Our analysis aims to help shape this understanding so businesses can develop the most appropriate approach.

We have evaluated blockchain opportunities across the automotive value chain, analysing characteristics that could be used to resolve a number of business issues. We have grouped our results into the following:

1. Trial projects

These opportunities have a lower immediate value relative to others due to a narrower blockchain application. However, they are attractive as they are less complex to implement than other opportunities. Blockchain opportunities in this segment relate to odometer fraud, electric vehicle payments, and dealer and customer incentives.

2. Investigate

These are more attractive opportunities relative to trial projects in terms of value but are similar in complexity (and cost), offering greater value relative to investment in the short-term. Blockchain opportunities in this segment relate to targeted recall, extended vehicle ledger, know your supplier, and auto leasing and finance contracts.

3. Wait and see

These opportunities currently offer a lower value relative to other blockchain opportunities and are more

complex (and costly) to implement. Although they will provide value for businesses and have potential to generate further benefit, at the most basic level they may not be worth heavily investing in yet. Blockchain opportunities in this segment relate to insurance contracts, and provenance or trace and verification of parts.

4. Transformative

These offer the most attractive opportunities in terms of potential value. However, they are heavily influenced by external factors and also considered the highest risk option. Blockchain opportunities in this segment relate to connected services, connected supply chain and ride sharing, and on-demand mobility services.

We expect a tipping point within the next five years, due to the combined impact of changes in automotive ownership and sales models, and greater understanding and adoption of blockchain. The result will be wholesale adoption of blockchain following a period of trials and pilots.

Interest will grow over the next two to three years as more businesses explore blockchain opportunities. This interest will develop into detailed enterprise strategies and implementation of blockchain prototypes. The more advanced businesses will be focused on how to scale up the opportunities they have identified.

The rationale and value of investing in blockchain will depend on a company's overarching strategic objectives as well as its capacity and capabilities. However, those who do not consider the impact are at risk of falling behind. Those who are more proactive will have the ability to take earlier advantage in generating value for their business.

Organisations will need to assess which blockchain capabilities and opportunities are most suitable for them, as well as where, how and how much to invest. For some, this will include a strategic assessment to explore opportunities. For others, it will be about enhancing existing blockchain capabilities to achieve further value, alongside other technologies.

We envisage significant benefits arising from blockchain opportunities and are developing our own blockchain solutions to support the automotive industry's challenges.



2. Auto disruption and the role of blockchain

This chapter outlines key characteristics of blockchain and its relevance to the auto market, both now and in future.

What is blockchain?

Blockchain is a digital, decentralised, distributed ledger that provides a way for information to be recorded, shared and maintained by a community.

Key characteristics of blockchain are listed in Figure 1.

Figure 1. Features of blockchain

Blockchain is:

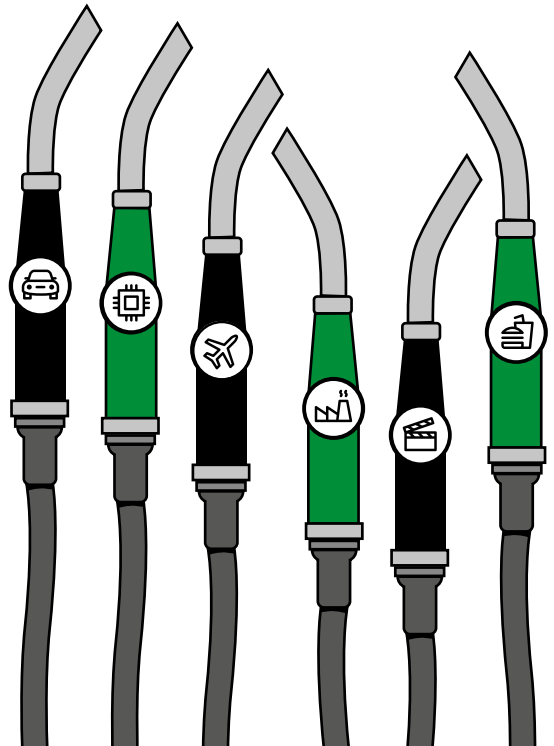
- **near real-time** – enabling almost instant settlement of recorded transactions, removing friction and reducing risk.
- **reliable and available** – as multiple participants share a blockchain, it has no single point of failure and is resilient in the face of outages or attacks.
- **transparent** – transactions are visible to all participants, with identical copies maintained on multiple computer systems, increasing the ability to audit and trust the information held.
- **irreversible** – it is possible to make transactions irrevocable, which can increase the accuracy of records and simplify back-office processes.
- **immutable** – it is nearly impossible to make changes to a blockchain without detection, increasing confidence in the information it carries and reducing the opportunities for fraud.
- **digital** – almost any document or asset can be expressed in code and referenced by a ledger entry, meaning that blockchain technology has very broad applications.

Figure 2 provides an overview of blockchain in terms of how it works. Further details on the concepts and workings of blockchain can be found in previous reports by Deloitte.¹

Understanding of and interest in blockchain is varied

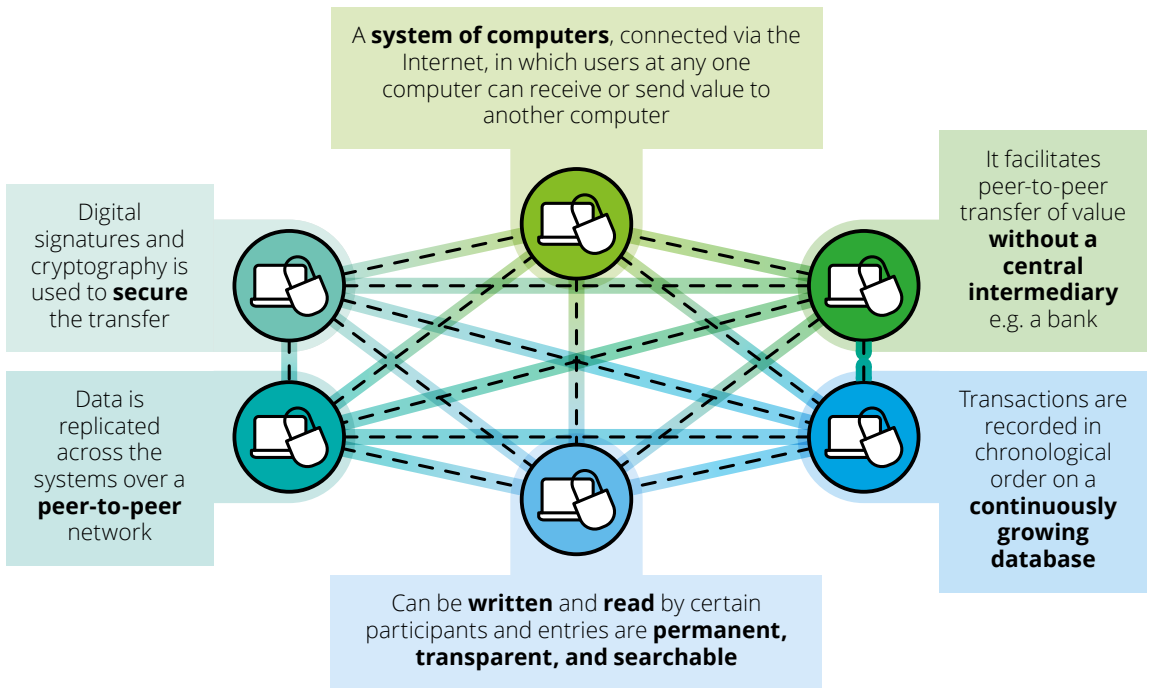
There is significant interest in blockchain at the C-suite level, with global investment exceeding US\$1.7 billion in the last three years. Market research firm Gartner estimates that blockchain's business value-add will grow to US\$176 billion by 2025.²

Blockchain is the technology that underpins bitcoin and other cryptocurrencies. Although the financial services industry accounts for a significant amount of current investment and activity in blockchain, a survey by Deloitte revealed that other industries may be even more aggressive in pursuing blockchain strategies. The report highlights that concepts, prototypes and investments are emerging in every major industry.³



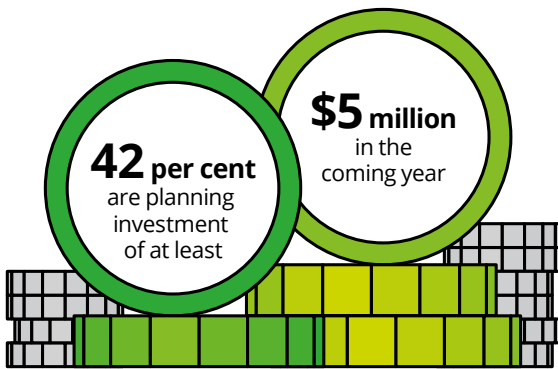
Source: Deloitte University Press, 2015.

Figure 2. Overview of blockchain



In addition, executives in the consumer products and manufacturing industries (which encompass automotive) expressed the most bullish blockchain outlook, with 42 per cent planning investment of at least \$5 million in the coming year.

Indeed, some organisations are already seeing the potential use and benefits of blockchain technology to solve complex problems and generate new opportunities. There are also a number of partnerships being formed to develop new use cases across the industry.



However, uptake of blockchain is extremely varied. And, based on discussions with businesses in the industry, the level of knowledge among the majority of executives relates to the concept and benefits at a broad level, rather than specific and detailed understanding of which applications would be most relevant and valuable to their business.

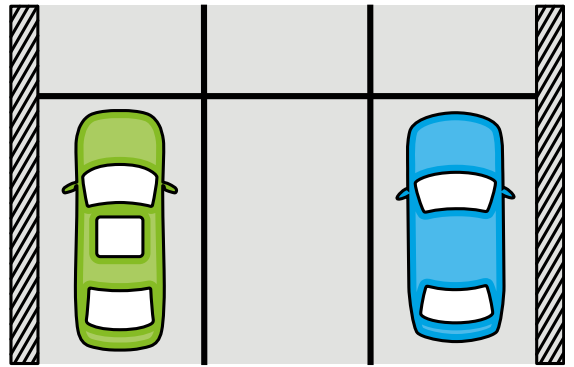
The rationale for blockchain across the automotive industry is considerable...

Our broader research relating to the future of mobility, digital transformation, the automotive consumer and other key trends affecting the industry suggest there are blockchain opportunities across the value chain.⁴

Consumer behaviours are changing with an increase in e-mobility and on-demand services. There is a greater willingness to share data and use technology which is accelerating this. Consumers are becoming more digital and demanding an enhanced experience. Car/ride sharing is becoming more popular among young urban consumers. Demand for electric vehicles is growing as consumers seek cheaper, environmentally friendly alternatives.

In turn, **technological advances and greater appetite for use of data** will enable businesses to offer more mobility and logistics services as well as innovative products and manufacturing techniques. There is a significant amount of untapped data and customer information. This customer data can be monetised by accessing customer insight through analytics. Car usage and experience analytics in particular will allow for new monetisation opportunities. The move towards automated and autonomous driving is creating a new paradigm in driving and transport. However, the **disjointed or fragmented nature of supporting systems in the value chain** often results in a complex and slow process in purchase and delivery of a vehicle. This is a recurrent complaint of consumers and conflicts with their purchasing needs. It also results in difficulties in tracking and verifying vehicle components and their provenance.

Further inefficiencies exist in the current industry with **vehicles being underutilised and expensive to own**. Cars are parked (and inactive) 95 per cent of the time yet vehicle owners incur ongoing fixed costs such as insurance, tax, maintenance and parking.⁵



Regulation and new competition are also having a significant impact on operating models and IT systems of banks and captives finance providers. Initiatives such as open banking and peer-to-peer lending are bringing in new market entrants from previously unrelated industries. Digital banking is affecting customer experience of financial services and products for automotive consumers.

Opportunities therefore exist across the industry, including for Original Equipment Manufacturers (OEMs), suppliers, dealers, financiers and end-consumers among others.

Figure 3. Examples of blockchain opportunities in automotive

Blockchain could be used to:

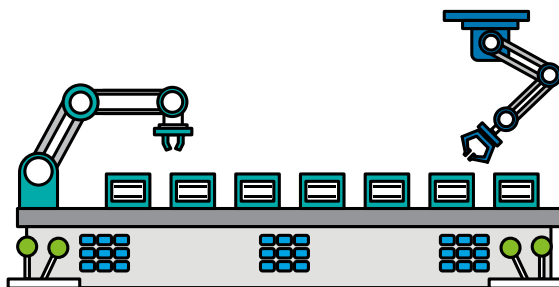
- share data on vehicles and their owners, manufacturers and dealers in a secure way
- monetise that data and derive more value from vehicles by increasing utilisation and selling unused space through car sharing
- link data held by different businesses across the industry including manufacturers, dealers, auto finance providers and insurers
- enable consumers to save money through 'pay as you go' access to mobility and cheaper insurance based on usage and accurate data.

Figure 3 outlines some examples of blockchain opportunities that can address key issues facing the automotive market by improving processes and use of data and information. Subsequent chapters describe and assess a range of opportunities or use cases across the automotive value chain.

Maximising the potential impact

Blockchain has been likened to the second generation of the internet. This could be exaggerated, but at the very least it has the ability to transform an organisation's processes.⁶ This is the realm of the blockchain – a protocol for exchanging value over the Internet without an intermediary.

By 2020, according to Gartner research, 40 per cent of the world's blockchain business value-add will be derived from the manufacturing sector.⁷



Thinking about the business operating model, blockchain can be applied in different ways. It can also be used to make existing processes more efficient, to support the move into adjacent services and markets, and/or help the development of new transformative services.

In response to this, many business leaders are asking questions about what technology to invest in, what the benefits are, when to invest and how to get started. The aim of this paper is to help companies in the automotive sector gain a better understanding of blockchain and prompt consideration of how it can be incorporated into a business strategy.

Blockchain is not a tactical response to a standard technology problem.⁸ While it can facilitate transformation, a clear strategy must be developed based on proof of concepts for opportunities. Complexity and value will inherently differ between organisations as will business objectives and strategies on how to achieve them.

While blockchain can be used in isolation, it is likely to have a bigger impact when combined with other technologies such as big data, Internet of Things and Artificial Intelligence. This can provide enhanced solutions, such as smart mobility solutions linked to location-based automotive services.

More ambitious, cross-industry use cases are also emerging. For instance, a solution to decentralised energy generation and peer-to-peer energy trading could utilise blockchain technology to record the transaction. In future, vehicles could be charged and help transport energy across micro-grids.



3. Practical applications of blockchain within automotive

As previously outlined, there are a number of use cases in the automotive sector. The analysis in this report is based a selection of twelve use case groups.

The use case groups were developed from an initial analysis of over 40 use cases which were short-listed and combined to cover the breadth of the automotive market and blockchain applications. Each use case group may cover a range of individual use cases.

The use case groups have also been allocated to a 'use case purpose' depending on the reason for the blockchain application. The three 'use case purpose' categories are:

- **Verification and process improvements** – to improve process efficiencies across the supply chain and back office.
- **Vehicle management and incentives** – to improve vehicle information and usage data across the industry.

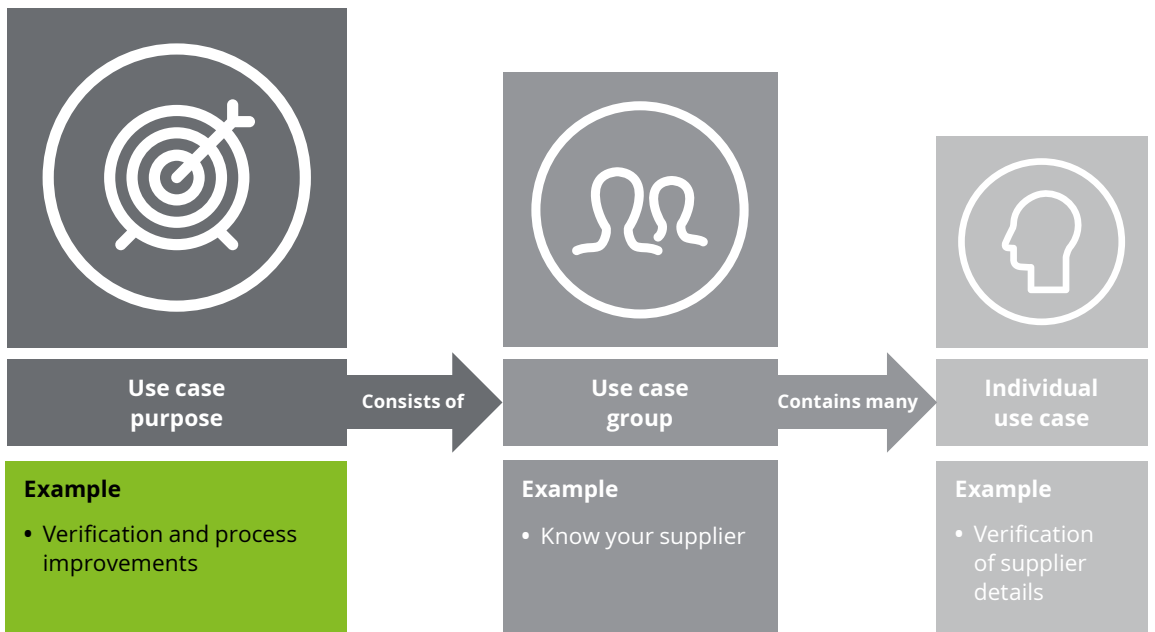
- **Finance, payments and insurance** – to improve transactions processes and information relating to this.

Figure 4 shows an example of the hierarchy of categories relating to use cases that are referred to in this report. Individual use cases are not assessed separately in this report but have been assessed as part of a use case group. Please see the annex for further details of these categories, how they relate to the broader context and the method used in this analysis.

In practice, individual use cases and use case groups may be combined. For the purpose of this analysis, we have assessed use case groups as defined in this chapter.

Figures 5 to 7 provide descriptions of each of the twelve use case groups assessed in this report. An example of a pilot or prototype is also provided for context but it should be noted that a variety of examples exist.

Figure 4. Categorisation of use cases



Verification and process improvements

Across the value chain there are a number of blockchain use cases aimed at enabling verification and process improvements. The four use case groups within 'verification and process improvements' are described in Figure 5.





Figure 5. Automotive use case groups to support verification and process improvements

 <p>Know your supplier (KYS)</p>	<p>A blockchain based solution that captures, stores and verifies supplier details, using external information, prior to the supplier providing services to automotive organisations. Once verified, supplier contracts could be stored on the blockchain and payments executed when a service or product has been fulfilled. Data can also be provided 'off-chain' to support supplier performance reporting and to inform future contractual agreements.</p>	<p>Example</p> <ul style="list-style-type: none"> • Deloitte's SmartID – individuals and organisations manage digital identities, which can then be used for digital agreements, digital assets and workflows as they have been validated and recorded on the blockchain.
 <p>Provenance/trace and verify parts</p>	<p>A blockchain based solution that captures, stores and updates information on vehicle parts including spare parts. It will enable the service centre, car manufacturer and customer to trace the origin of spare parts through the supply chain to the original manufacture date and location.</p>	<p>Example</p> <ul style="list-style-type: none"> • Deloitte ArtTracktive – a proof of concept which provides a distributed ledger for tracking the provenance and whereabouts of items such as fine artworks.
 <p>Connected supply chain</p>	<p>A blockchain based solution that provides an end-to-end supply chain solution to enable automotive organisations to seamlessly order or sell, track and pay for goods once they arrive at their destination. Documentation would be created, updated, viewed or verified by parties on the blockchain. Payments could also be initiated seamlessly between parties throughout the process based upon agreements (e.g. between seller and customs authorities, seller and shipping company and between seller and buyer). As an extension, connected IoT sensors and smart devices could measure the condition of containers and other information that can be recorded on the blockchain and inform final settlements e.g. if goods have been damaged.</p>	<p>Example</p> <ul style="list-style-type: none"> • Deloitte's Tracechain – creates digital identities for physical goods in the supply chain and enables the tracking and tracing of finished goods and materials.
 <p>Targeted recall</p>	<p>A blockchain based solution that enables car manufacturers to identify vehicles that contain defective parts, and therefore issue specific recalls or service bulletins for these vehicles. This can reduce disruption to customers as well as the recall costs for the process. This application will also track the status of the recall, for instance vehicles received by dealer for repair or vehicles repaired, which can be used for regulatory reporting to government.</p>	<p>Example</p> <ul style="list-style-type: none"> • Potential application of Deloitte Tracechain and SmartID.

Vehicle management and incentives

Across the value chain there are a number of blockchain use cases aimed at enabling vehicle management and incentives. The four use case groups within 'vehicle management and incentives' are described in Figure 6 below.

Figure 6. Automotive use case groups to support vehicle management and incentives

 <p>Dealer and customer incentives</p>	<p>A blockchain based solution that records dealer and customer purchases and issues loyalty points that can be redeemed and used as a currency within the OEMs loyalty network. For example, the dealer could supplement purchase of parts with customer-redeemed loyalty points at a discount. Once the loyalty points are redeemed, the dealer's account would be updated for participants on the network to view.</p>	<p>Example</p> <ul style="list-style-type: none"> Loyal's loyalty and rewards platform – uses blockchain and smart contract technology to enable instant redemption of loyalty points, removing delays, costs and poor integration with other systems.
 <p>Extended vehicle ledger</p>	<p>A blockchain based solution that securely stores, updates, traces and shares vehicle data (including telematics) across OEMs and with external parties in real time. The vehicle ledger could include the storage of a car's maintenance and ownership history and would enable OEMs and other authorised parties to view and update the vehicle data to the blockchain. Users will be able to receive payment through the global ledger for services rendered, e.g. repairing a vehicle, the purchasing and selling of a vehicle or the purchasing and selling of the vehicle data to third parties (autonomous vehicle data). This technology could complement or replace the physical log book.</p>	<p>Example</p> <ul style="list-style-type: none"> carVertical's car history registry – gathers and verifies information about cars' history from different sources and charges users to access the data.
 <p>Odometer fraud</p>	<p>A blockchain based solution that uses an in-car connector to send vehicle mileage data on a regular basis to its 'digital logbook'. If odometer tampering is suspected, the display mileage can be checked against the mileage recorded on a system via a smartphone app. A car owner can log their mileage on the blockchain and when they sell their vehicle, receive a certificate of accuracy that confirms the veracity of their car's mileage.</p>	<p>Example</p> <ul style="list-style-type: none"> Bosch IoT lab – exploring use of blockchain via an app to check and verify odometer data.
 <p>Ride-sharing and on-demand mobility services (MaaS)</p>	<p>A blockchain based solution that records and executes agreements and monetary transactions to enable vehicle owners (individuals) to monetise trips. This solution would interconnect smart and/or autonomous vehicles, car-sharing providers and the end-users in a secure and reliable manner. Users and car-sharing providers (fleets, organisations or individuals) would register on the blockchain and exchange data securely and seamlessly. Such data could include vehicle location, keys to unlock the car, agreement terms (e.g. cost per mile, insurance details) and user payment information. The solution would also process all payments following completion of the trip and update the user's record with a history of that trip.</p>	<p>Example</p> <ul style="list-style-type: none"> Toyota Research Institute/Oaken Innovations – application for P2P car sharing, vehicle access and mobility payments.

Finance, payments and insurance

Across the value chain there are a number of blockchain use cases aimed at enabling finance, payments and insurance. The four use cases groups within 'finance, payments and insurance' are described in Figure 7 below.

Figure 7. Automotive use case groups to support payments and insurance

 <p>Insurance contracts</p>	<p>A blockchain based solution that enables insurance firms to create personalised vehicle insurance contracts based on actual driving behaviour and automate the payment of insurance and financial settlement following an insurance claim. Driving behaviour events (e.g. speeding, mileage) and safety events (e.g. damaged parts, collisions) of a vehicle's owner could be stored on the blockchain, shared and used to calculate insurance premiums and payments. As the record is linked to the owner, the history of the vehicle owner remain available to the insurance company for future insurance quotes, even after the car is sold.</p>	<p>Example</p> <ul style="list-style-type: none"> • Gem/Toyota Insurance Management Solutions/ Aioi Nissay Dowa Insurance Services – usage-based insurance.
 <p>Auto leasing and finance</p>	<p>A blockchain based solution that connects the involved entities when leasing a vehicle to a customer in a secure way, from performing KYC customer checks (e.g. licence and credit check) prior to leasing the vehicle, storage of leasing agreement/contract on the blockchain, through to automated payment once the vehicle has been returned.</p>	<p>Example</p> <ul style="list-style-type: none"> • Daimler AG/Landesbank Baden's corporate Schuldschein – Württemberg (LBBW) – execution of financial transactions.
 <p>Connected services</p>	<p>A blockchain based solution that enables vehicle owners to purchase 'infotainment' services seamlessly or additional customer services (e.g. linking to in-home devices or paying for parking) based on pre-defined contracts and agreements stored and executed on the blockchain.</p>	<p>Example</p> <ul style="list-style-type: none"> • ZF/UBS's Car eWallet – cashless, on-the-go payments for tolls, parking and electric charging.
 <p>Electric vehicle payments</p>	<p>A blockchain based solution that manages contracts, billing and payments when an electric vehicle owner charges their vehicle at a charging station owned by a third party or discharges their electricity from their EV to the grid to support the stabilisation of the energy network (e.g. transporting energy from rural areas to cities).</p>	<p>Example</p> <ul style="list-style-type: none"> • RWE partnership with Slock.it – Biocharge is a peer-to-peer EV charging and payments system.



4. Assessing blockchain opportunities

Our analysis is aimed at identifying where, in both the traditional and future automotive industry, blockchain could have the greatest impact.

Blockchain's value – based on business benefits

The criteria used to assess the value to business of the blockchain opportunities are based on the Deloitte Enterprise Value Map. This is a tool which identifies factors stimulating business growth. The criteria include factors that support organisational growth through:

- **strong revenue growth** – including factors that support volume and price
- **better operating margins** – including factors that support the selling and administrative side as well as cost of goods sold
- **improved asset efficiency** – including the effectiveness of property, plant and equipment as well as inventory
- **expectations** – including factors that affect company strengths and perceptions.

Within the Deloitte Enterprise Value Map there are over 500 strategic and tactical elements that can influence these criteria and thus affect business growth. Examples of the more granular elements include improvement of incentives in relation to procurement efficiency and developing a stronger brand.

For each strategic and tactical element, a score was assigned based on whether the use case would be relevant and whether it would help solve a problem inherent in the industry or organisation. Consideration was also given to whether or not the blockchain use case would be the most appropriate solution.

The resultant range of values for the blockchain use cases is shown in Figure 8. A higher position represents a higher value.

Assessing blockchain's complexity

The complexity criteria are based on the level of business change required, unique participants and active participants (volume), the number of services and whether the use case has been tested before.

The potential range for complexity or ease of implementation of the blockchain use cases is shown in Figure 8. A position further to the right represents a more complex implementation and adoption process.

Strategic choices will affect the attractiveness of use cases

Our analysis has not considered use cases of 'low value'. Therefore, depending on the strategic objectives of the business, there are four segments of impact:

1. Trial projects

These opportunities are attractive as they are less complex to implement than other opportunities. However, the immediate value is lower relative to others due to a narrower focus of the blockchain application. These include blockchain opportunities relating to odometer fraud, electric vehicle payments and dealer and customer incentives. Businesses that are exploring blockchain opportunities could consider these as a starting point, if relevant to their organisation, and expand them to obtain more value in future.

2. Investigate

These opportunities are more attractive relative to the trial projects in terms of value yet have similar levels of complexity, offering greater value relative to investment in the short-term. These include blockchain opportunities relating to targeted recall, extended vehicle ledger, know your supplier and auto leasing and finance contracts. Again, businesses that are exploring blockchain opportunities could consider these as a starting point, if relevant to their organisation.

3. Wait and see

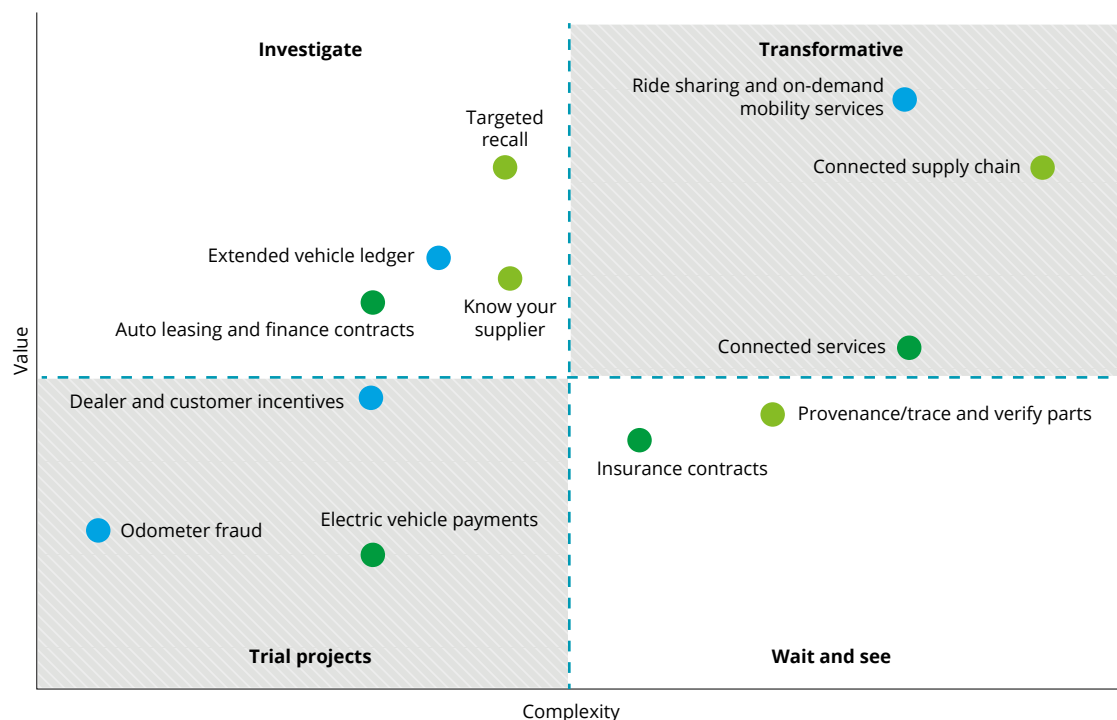
These opportunities currently offer a lower value relative to other blockchain opportunities and are more complex to implement at present. Although they will provide value for businesses and have potential to generate further benefit, at the most basic level they may not be worth investing heavily yet. These include blockchain opportunities relating to insurance contracts and provenance/trace and verify parts. Again, businesses where these opportunities may be relevant should keep a close eye on how these evolve in future and consider combining these with other opportunities.

4. Transformative

These opportunities are the most attractive in terms of the value they offer. However, they are heavily influenced by external factors and also considered the highest risk option. These include blockchain opportunities relating to connected services, connected supply chain and ride sharing and on-demand mobility services. Businesses that pursue these opportunities are likely to form part of a consortium in order to deliver these projects.

Understandably, the uses cases that offer the highest value are also the most complex (and most costly) to implement. The potential impact of blockchain opportunities by primary reason (use case purpose) vary by value and complexity, demonstrating the breadth of applications across the sector's value chain.

Figure 8. Value and complexity/ease of implementation of blockchain use case groups



Key (Use case purpose)

- Verification and process improvements
- Vehicle management and incentives
- Finance, insurance and payments

Source: Deloitte analysis



5. Responding to blockchain

It is important for businesses to understand how much blockchain can generate more commercial value and how this aligns to the overall business strategy.

Exploring opportunities is the minimum required for the short-term

The analysis in this report can be used to help review the potential value for businesses. Those who are new to blockchain could experiment with one or two 'investigate' opportunities while watching 'transformative' opportunities.

The uncertainty of future value and nascent applications of blockchain, mean that, at this stage, many organisations may prefer to explore and test uses rather than commit to full enterprise adoption.

However, the rapid pace of improvements in blockchain technology mean that, within one to two years, blockchain could provide a solution to many of the challenges faced by the industry today.

Indeed, blockchain could replace processes within this timeframe. For example, work programmes that last more than two years may be inherently outdated before they are even implemented.

We expect the tipping point to be within the next five years, at which point we expect wholesale adoption across the industry.

Maximising opportunities

We expect the biggest opportunities to come from multiple blockchains, seamlessly integrated and working together across a value chain. For instance, the 'Know your supplier' use case group offers significant value but this can be even greater if it is combined with other blockchain applications to utilise financial and operational data and understand the end-consumer. However, organisations must consider how to implement this effectively, how to integrate multiple blockchains, legacy systems and databases for on-chain/off-chain solutions and how to build the architecture for this.

The most valuable and possibly the most complex blockchain solutions will require both on-chain and off-chain data, local storage and integration capabilities to obtain a seamless solution.

Reviewing the potential impact - responding to the opportunity and disruptive trends

The potential impact of individual blockchain opportunities may vary within each use case group. The potential value and complexity are also likely to vary as the automotive landscape changes due to factors such as new competition, compliance changes, Brexit and other disruptive factors.

For instance, in future, with increased vehicle autonomy and sharing, the asset efficiency of vehicles will increase (in terms of hours per day) resulting in more miles per year per vehicle. This will place more emphasis on maintenance of parts and vehicle refurbishment. In turn, blockchain use cases related to this – such as 'Provenance/trace and verify parts' will generate more value than offered today.

Next steps

In order to realise potential benefits, organisations need to assess which blockchain capabilities are most suitable for them, as well as where and how to invest.

Key questions leadership should be asking include:

- How can blockchain technology drive value in my business?
- Are there new products, services or business models that we want to explore that blockchain enables?
- How are our competitors utilising blockchain technology?
- How are other industries applying blockchain technology?
- Are there any projects that could be replaced or enhanced by blockchain technology?

At the very least, this will include an evaluation of strategic objectives and assessment of use cases most relevant to each organisation.

Those further ahead will be exploring the development of a blockchain solution which considers the technology architecture, costs and benefits in more detail.

The trailblazers will be looking at enhancing existing blockchain capabilities to scale up and realise the full value of blockchain, alongside other technologies.

We believe the key for all businesses is to ensure their blockchain plans address critical business issues and support new growth opportunities. Businesses should also consider their organisation's readiness to adopt blockchain, understand what technology is needed and develop their blockchain strategy to iterate and scale up on this basis.

Businesses that do not consider how blockchain may impact their operations are at risk of falling behind and losing out on potential growth opportunities offered by blockchain.

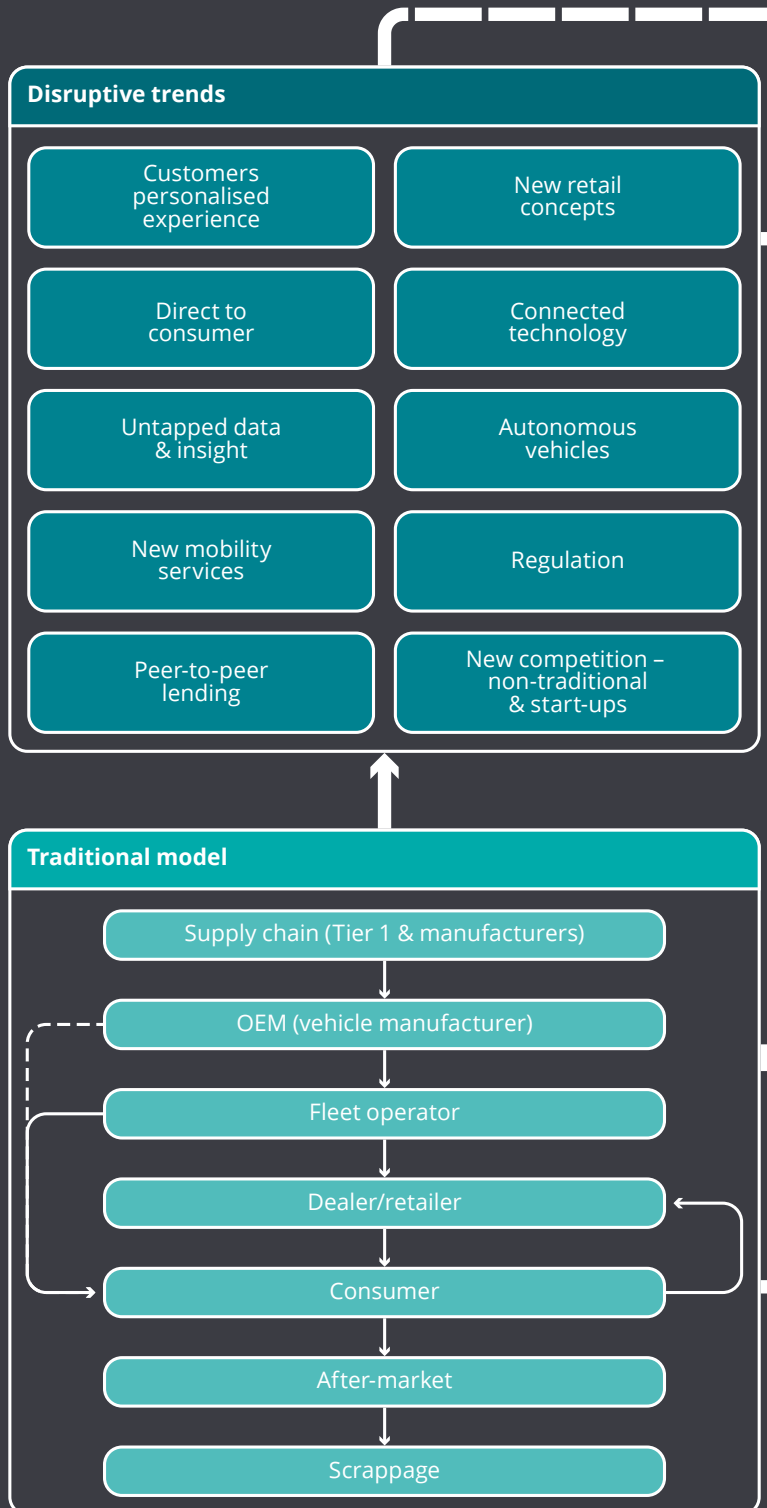


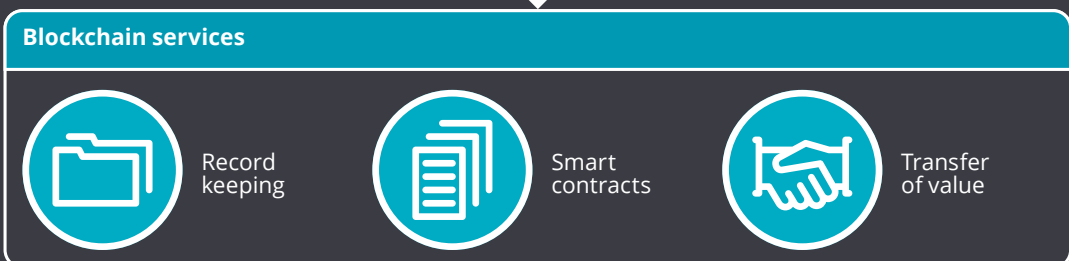
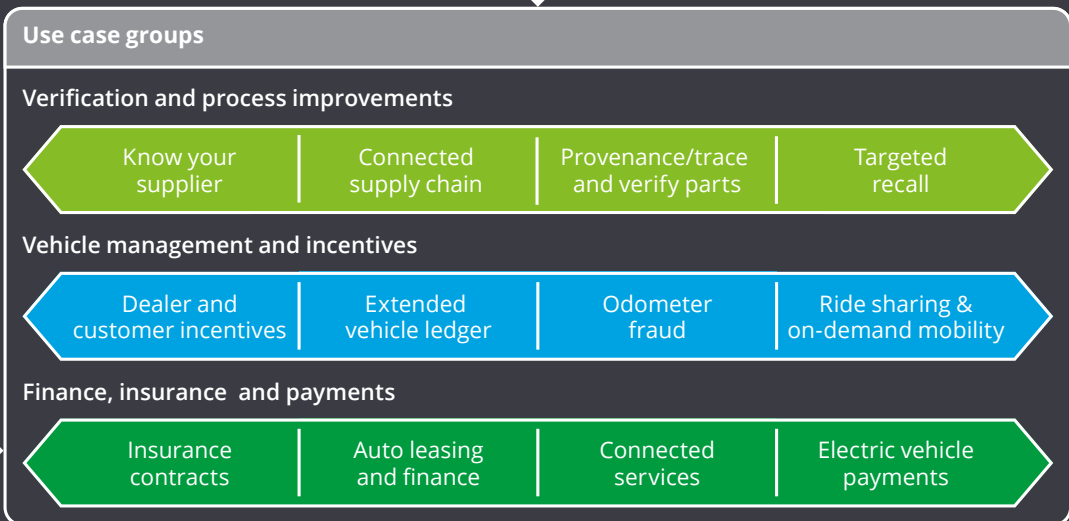
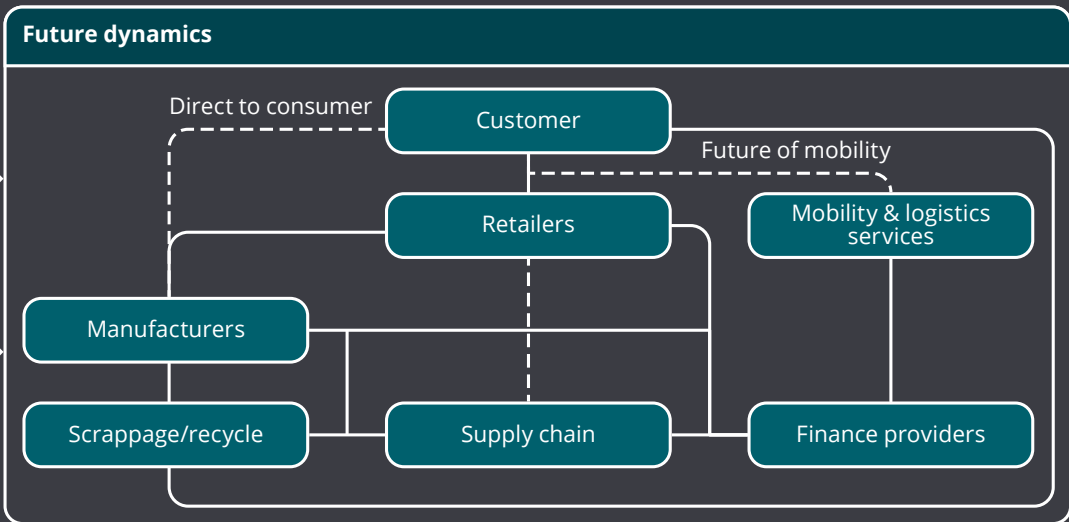
6. Annex: Assessment framework and method

The framework below was developed to guide the analysis of use cases, taking into account the complexity and multiple applications of blockchain as well as the changing dynamics of the auto industry.

The selection of use cases aims to cover a range of blockchain applications across the breadth of the value chain, both now and in future.

This chapter outlines the considerations taken into account when selecting the use cases to be assessed in this report. Chapter 3 describes each use case. Chapter 4 presents the results of the analysis of these use cases in terms of their potential value and complexity.





Use cases selected to cover breadth of automotive market and range of blockchain services

The framework and approach developed for this paper is based on an extensive review of examples of blockchain technology in the automotive market as well as discussions with sector experts and Deloitte analysis.

An initial assessment of over 40 use cases was completed before short-listing and combining into the selected twelve use case groups.

The use cases are also described in more detail in chapter 3.

Use cases have been classified by purpose. Each use case group contains opportunities where a similar approach, objective and blockchain technique are required. Each of these blockchain groupings have been further classified into three areas of purpose:

1. Verification and process improvements
2. Vehicle management and incentives
3. Finance, insurance and payments.

The lower left section of the framework shows the range of blockchain services. At a broad level, these can be categorised as follows:

- **record-keeping:** secure, auditable and immutable records of digital and physical assets
- **smart contracts:** self-executing contracts which can automate lengthy and inefficient processes
- **transfer of value:** issue new or exchange of ownership without intermediaries.

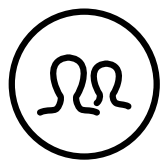
These cover specific services such as 'track and trace', cryptocurrencies, smart contracts and oracles.

Change in traditional model to a new dynamic, consumer-led industry

The framework illustrates the shift in the way the industry operates. The linear model of the vehicle purchase and ownership lifecycle is becoming more dynamic and customer-led.

Disruptive trends are having a significant impact on the way the industry operates as outlined in chapter 2.

Some of these trends are depicted at the top of the framework. Collectively, these trends could influence the value and uptake of a given use case as discussed in Chapter 5.



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8. Endnotes

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2. Blockchain @ Auto Finance – How blockchain can enable the Future of Mobility, Blockchain Institute, Deloitte, 2017.
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See: <https://www2.deloitte.com/insights/us/en/focus/signals-for-strategists/trends-blockchain-bitcoin-security-transparency.html>
4. See: <https://www2.deloitte.com/insights/us/en/focus/future-of-mobility/roadmap-for-future-of-urban-mobility.html>
5. See: <http://fortune.com/2016/03/13/cars-parked-95-percent-of-time/>
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7. Forecast: Blockchain Business Value, Worldwide, 2017-2030, Gartner, March 2017.
8. Practical Blockchain: A Gartner Trend Insight Report, March 2017.



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