Impact of Blockchain technology on Automotive Industry

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Abstract: Blockchain has presented its benefits in real world in many industries. This technology is now expanding in financial sector. The automobile industry is technology-intensive, and has been from its beginning. The 21st-century cars are moving data centers with on-board sensors and computers that capture information about the vehicle. Here we examined the current situations in the automobile industry. We contrived various surveys in hunt for various issues faced by manufacturers and the customers in the automotive industry. The issues highlighted in this research papers can be overcome using the perquisite of blockchain technology.

Keywords: automobile industry, blockchain

1. INTRODUCTION

The automobile is one of the vast industries in the world. The scope of discussion about this industry is generally limited to the manufacturing and sale of the new automobiles. In this paper, we attempt to broaden the scope of discussion. The automobile industry has always advanced itself using technology with innovations ranging from hybrid, electric and self-driving smart cars to the Industrial Internet of Things (IIoT) integration in the form of IoT-connected cars. This industry is vast yet so connected that there emerges the necessity to keep a track of the trade of goods and services, which is highly available yet secure and tamperproof. This need is not limited to the manufacturers but to the consumers as well. During this study, various scopes of advancement have also been discovered in this industry using the blockchain technology. Our results show that there are many areas of improvement an advancement in the automobile industry and highlight the very few companies which have started investing in this technology.

As indicated by an investigation by IBM distributed at the discontinuance of 2018, 62% of car officials are persuaded that blockchain will be a shrewd power in the vehicle business by 2021. A similar report withal found that 54% of soi-disant Auto Pioneers intend to execute their first business blockchain arrange at scale inside the following three years.
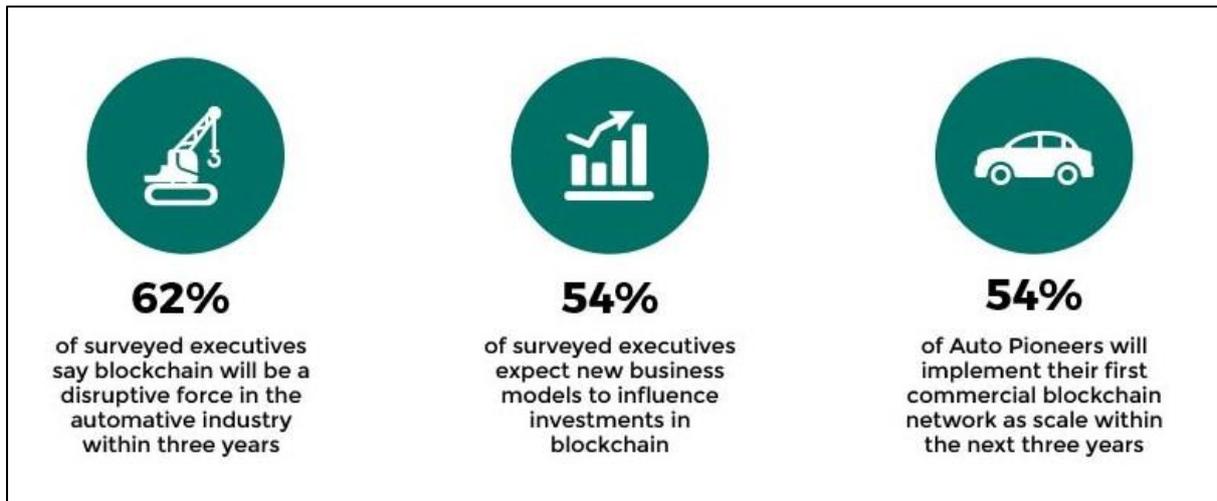
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Fig 1 : IMB survey 2018

2. BLOCKCHAIN BASICS

A blockchain is a developing rundown of records, called block, which are connected utilizing cryptography. Each block contains a cryptographic hash of the past block, a timestamp, and exchange information. The blockchain, which is also known as distributed ledger technology (DLT), is based on a peer-to-peer topology that allows data to be stored on multiple servers. The access of the ledger is granted to only those who are present or permitted in the network. The basic layout of a blockchain is illustrated in Figure 2.
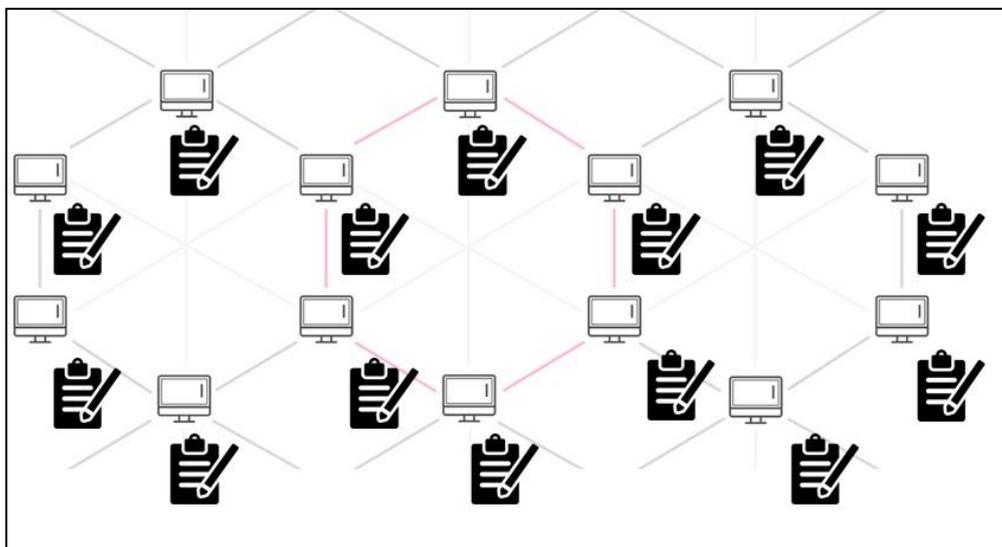

Fig 2: Blockchain basic layout

The advantages of blockchain innovation, which can upgrade the car business, are point by point in the following segment and are summed up in Figure 3.
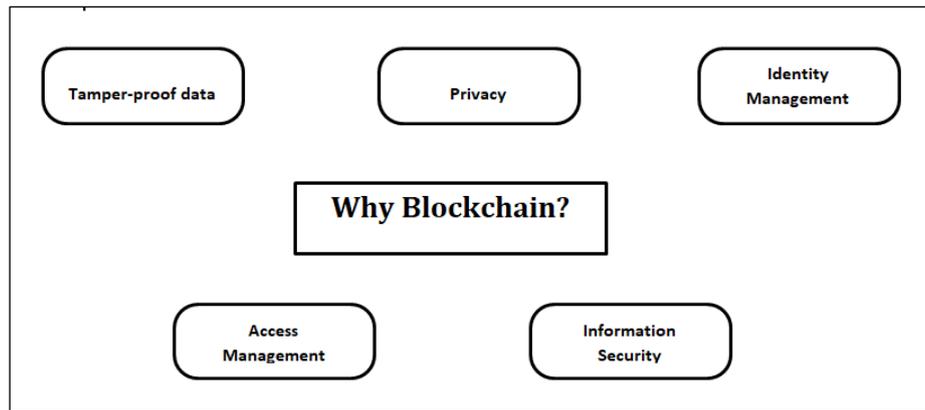
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Fig 3: Blockchain capabilities

Tamper-proof data

An industry with many stakeholders, it is necessary to maintain a unique and consistent data structure, which helps in reading and analysing data and taking decisions accordingly. Blockchain is an open electronic record worked around a P2P framework that can be transparently shared among divergent clients to make an unchangeable record of exchanges, each time-stamped and connected to the past one. Every time a set of transactions is added, that information turns into another block in the chain (consequently, the name). The updates are performed only by the consensus between the participants. It is a write-once, append-many technology, making it an irrefutable and auditable record of every single exchange. Each transaction recorded has a timestamp in the blockchain.

Privacy

Blockchain makes use of public key and private key. It uses asymmetric cryptographic algorithms for encryption and decryption. There are two primary open key cipher suites for Transport Layer Security (TLS): Rivest-Shamir-Adleman (RSA) based cipher suites that likewise utilize RSA as the key trade calculation; and Elliptic Curve Diffie-Hellman Exchange (ECDHE), which depends on Elliptic Curve Cryptography (ECC) and performs trades through Ephemeral Diffie-Hellman.

Identity Management

❖ **Unique ID:** Every user who registers on Blockchain's identity management system will receive a unique identity number. The unique ID number of the user consists of all personal identifiable information in an encrypted format that is stored on their IPFS backed device. Blockchain Identity Management allows users to simply share unique ID with any third party to authenticate themselves directly..

❖ **Consent:** A blockchain identity management system does not store information about any users. In addition, the system uses Smart Contracts to allow regulated disclosure of data. Therefore, data manipulation on the blockchain is not feasible. Blockchain-linked identity management system is highly secure for identity holders too. No transaction of information about users may take place without user's consent. This allows the user to control their sensitive personal details.

❖ **Decentralized**: The users will not store any personal identification documents on a centralized server. All documents identifying users are stored IPFS-backed on their device, making it safe from mass data breaches. Using IPFS-backed Blockchain identity management does not allow any hacker to steal the identifiable information. Since the system is being decentralized, no single

point of failure (SPOF) will occur. The single failure point reflects the portion of the system; if it fails, the system will cease to operate. The absence of SPOF therefore means the system can never compromise.

❖ **A universal ecosystem:** Management of the blockchain identity is set at no geographical boundaries. Therefore, users can use the international platform to verify their identity.

Access Management

It speaks to the policies, processes and tools to identify, control and deal with the approved access to a framework or application. Distributed technologies such as access control blockchain allow a new level of cyber security. Encryption methods as well as private-key permissions are indispensable for decentralized technology and allow for a more secure business environment in which organizations could provide peace of mind when it comes to many aspects of IoT, including the access management.

Information Security

In order to uphold a user's confidentiality, his / her private key must be secured, since such a key is what is required in combination with the user's public key to impersonate him / her. Key management systems can help to avoid tampering of the private key. In fact, blockchain technologies can also prevent IP spoofing and forgery attacks. Blockchains are by design inherently resistant to data modification. Blockchain ledgers are immutable meaning that they cannot be edited or deleted when data is added or transacted, thus ensuring data integrity.

Smart Contract

A smart contract is a self-execution contract whereby the terms of the agreement between buyer and seller are written directly into lines of code. The code and the agreements it contains exist across a network of distributed, decentralized blockchains. The code controls execution, and trackable and irreversible transactions. Smart contracts allow trustworthy transactions and agreements to take place between independent, anonymous parties without the need for a framework for central authority, legal system or external compliance.

3. RESULTS AND DISCUSSION

A survey was undertaken to demonstrate the issues faced by specific automotive industry stakeholders and to put light on the future enhancements. In addition, the solutions to those issues using the blockchain technology are specified further along. There is no common scale for the graphs shown below due to the vastness of this topic.

Have you faced issues with the delivery of your vehicle spare parts? (delayed, lost, stolen, replaced)

The graph below illustrates that 42.9 % of the survey respondents have faced issues with the delivery of their automobile spare parts. 45.7 % have not faced issues and the remaining 11.4% are unaware of the delay.

Delivery of spare parts might be lost, stolen, replaced, damaged etc. Blockchain would allow the manufacturer to follow up these pieces in full. In the case of a recall, blockchain would also facilitate

the procedures: as it carries the information about the origin of the piece, we could control if any modifications were made to it or if there was a manufacturing defect.
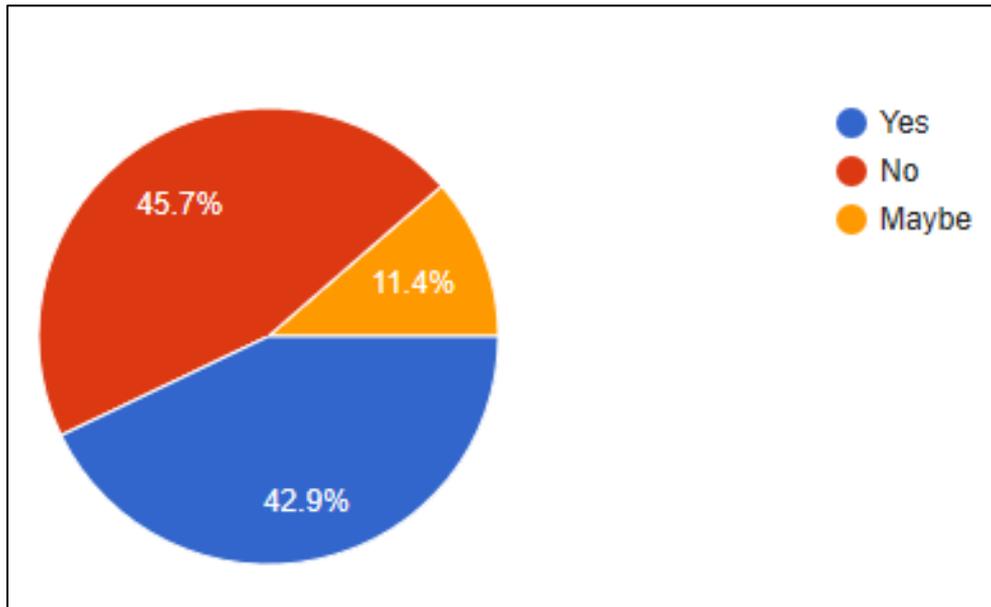

Fig 4 : Survey Question 1

Have you observed any manufacturing defect in your vehicle?

Notice that in the responses to this question 68.6% of the respondents do not face any issue when the automotive vehicle is been received by any party in between the system. Still 31.4% of the respondents do face issues during the delivery of the vehicle.

To overcome this issue there is numerous opportunities throughout the automotive manufacturing process to take advantage of the blockchain technology. We can use blockchain to store data for any vehicle assembly from start to finish from lading bills for vehicle components and quality-inspection records generated during manufacturing phase to WIP details.
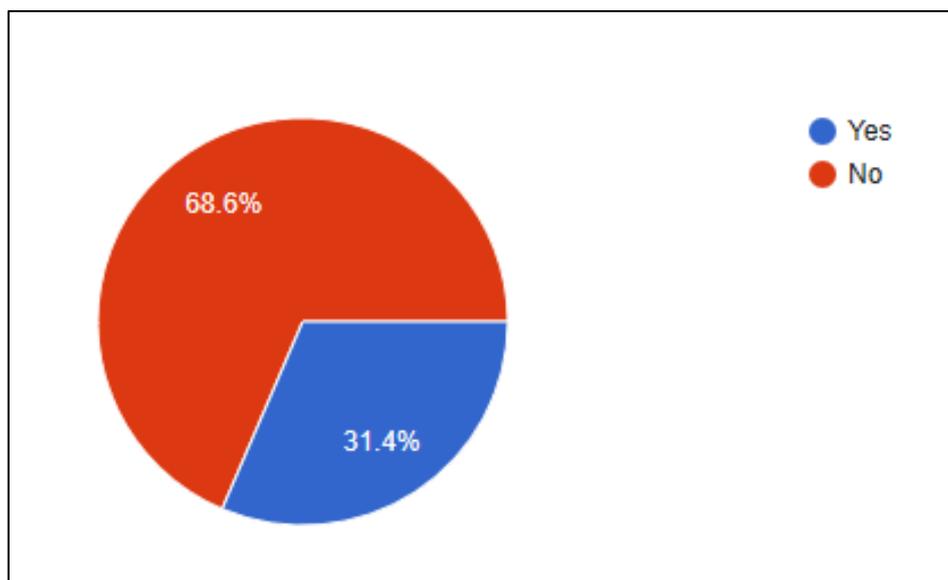

Fig 5 : Survey Question 2

Have you ever lost or misplaced your vehicle keys?

From the graph below, you see that 48.6% of the respondents have not lost/misplaced their vehicle keys whereas the remaining 51.4% have. With regard to this topic, Blockchain has also made progress. Bosch is promoting Perfectly Keyless as a system which will fully eliminate the car keys requirement. Drivers download an application to their smartphone, connect their cars to the app, and then the app will generate a single security key that fits their car's digital lock. The drivers can also give other people digital keys and restrict when certain keys can be used. When the digital key smartphone is less than two meters away from its sensors, the car will unlock and lock again when the phone leaves this zone. Once the sensors detect the phone inside the vehicle, the motor can be turned on by pressing the 'start' button
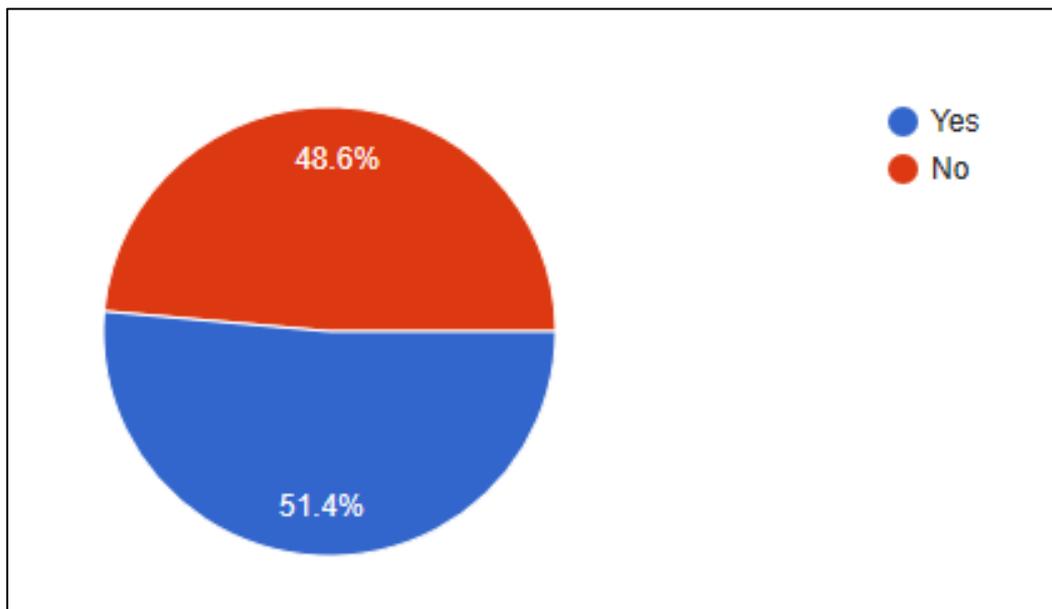

Fig 6 : Survey Question 3

Will autonomous vehicles exist in near future?

According to the survey data, 14.3 per cent believe there will be no autonomous vehicles in the near future. 24.7 per cent believe that they will soon be in place, and 60 per cent of respondents are not yet sure of that. Car giants General Motors and BMW are backing blockchain tech as a way to share self-driving car data between themselves and other automakers. It's all part of a bid to unlock valuable data held in silos that will eventually get autonomous vehicles on the road. Exploratory work in this area is being done under the auspices of the Mobility Open Blockchain Initiative (MOBI), a consortium formed last year to harmonize the development of distributed ledger technology (DLT) across the smart mobility sector.
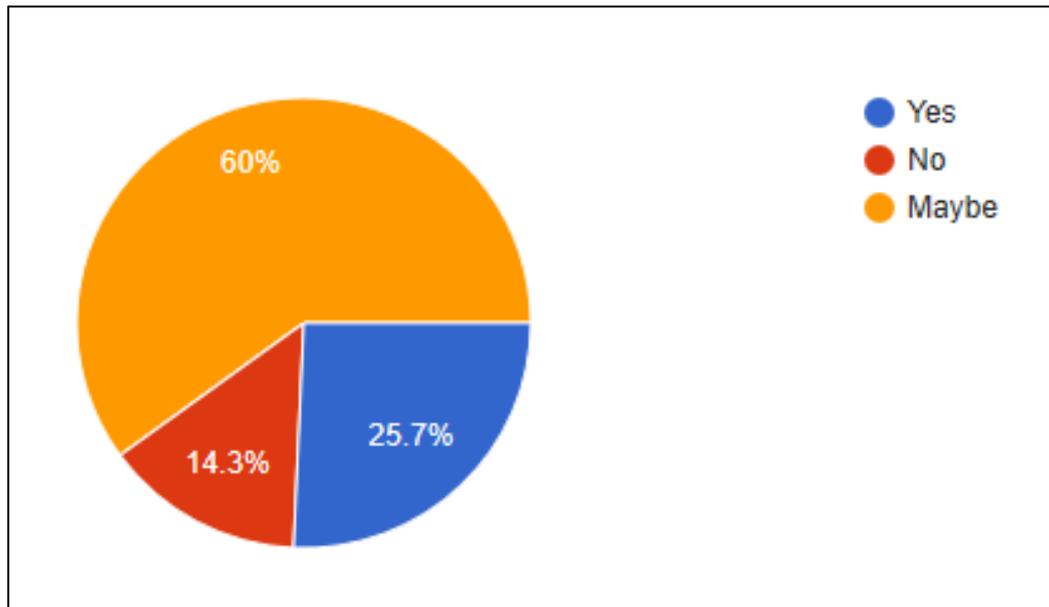
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Fig 7 : Survey Question 4

Have you come across issues in the pre-owned vehicle which you were not informed about by the previous owner?(If you own/owned a second hand vehicle)

68.69% of respondents experienced issues following the purchase of a pre-owned car, while 31.4% did not. For car owners, blockchain-based registries would mean easier verification of the vehicle's history (e.g. whether it has been in an accident) allowing, therefore, major transparency when purchasing a car. Another pro would be having an overview of the parts of the vehicle: the users could look up the origin of the carpets and solve repair-related problems. Not to mention, that the seller and buyer could enforce the transaction of goods without the need for an intermediary, thanks to a smart contract.
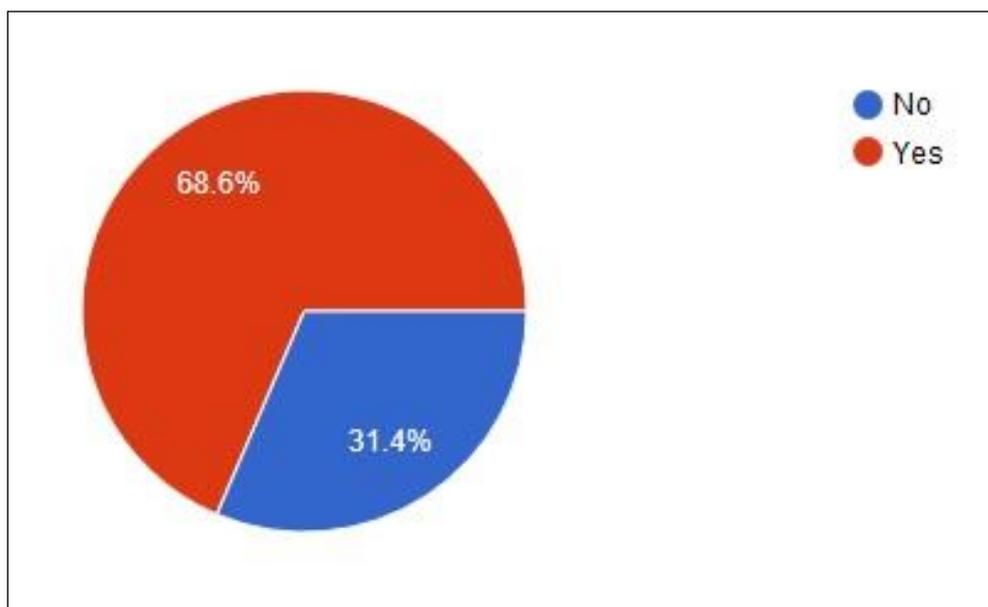

Fig 8 : Survey Question 5

4. OTHER APPLICATION OF BLOCKCHAIN TECHNOLOGY

❖ **Finances**

All processes that require manual data insertion include transactions or transaction costs, as well as revisions, among other things, could be streamlined. The Blockchain would accelerate these processes and keep them updated throughout the lifecycle of a car.

❖ **Vehicle safety and data security**

The more connected a vehicle is, the more susceptible it becomes to potentially deadly cyber-attacks. Thanks to blockchain's strong cryptographic roots that cannot be reverse-engineered, it is the perfect place to store data since it cannot be changed.

❖ **Telematics**

In the connected car space, telematics includes software-based navigation, vehicle-to - vehicle (V2V) communications, and a host of other services that could affect vehicle safety and passenger safety. We can use blockchain to keep data sent and received by telematics systems secure. An increased level of encryption prevents hackers from viewing or using this data.

❖ **Smart insurance**

Blockchain technology enables the unmanipulable and transparent logging of vehicle sensor data in a decentralized network. The unimpeachable record of the black box blockchain could help to resolve the circumstances of the crash, particularly in the case of self-propelled vehicles. Blockchain could also allow insurance to be taken to other vehicles, such as the user profile.

Examples of Blockchain Initiatives in Automotive Industry

❖ Ford has launched a blockchain pilot on IBM platform to ensure ethical sourcing of cobalt. By tracking the supply chain of cobalt on the blockchain, Ford hopes to ensure that companies are not using child-mined cobalt in lithium-ion batteries.

❖ Hyundai has announced a new partnership with IBM to advance the use of blockchain technology and cloud-based AI. IBM will focus on creating a new supply chain-financing ecosystem using open source Hyperledger Fabric. The project aims to automate manual processes, reducing cost and lead-time, and, through that, improving customer experience.

❖ Volkswagen is constructing a blockchain-based tracking system to prevent the widespread odometer fraud in the automotive sector. Making sure dishonest car sellers are unable to manipulate odometers to create misleading mileage values will help buyers save money.

5. CONCLUSION

Blockchain has shown the ability to disrupt the conventional industry with its main characteristics: decentralization, persistence, confidentiality and auditability. Many industries have benefited from the blockchain technology. There are several unaddressed problems and unknown areas of progress that need to be discussed and focused on in the automotive industry. With the advantages of blockchain technology, these challenges faced by different stakeholders can not only be overcome, but can also revolutionize the automotive industry.

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REFERENCES

[1] G. Zyskind, O. Nathan, and A. Pentland, ''Decentralizing privacy: Using blockchain to protect personal data,'' in Proc. IEEE Secur. Privacy Workshops (SPW), San Jose, CA, USA, May 2015, pp. 180–184.

[2] P. Giungato, R. Rana, A. Tarabella, and C. Tricase, ''Current trends in sustainability of bitcoins and related blockchain technology,'' Sustainability, vol. 9, no. 12, p. 2214, 2017.

[3] C. Decker and R. Wattenhofer, ''Information propagation in the bitcoin network,'' in Proc. IEEE 13th Int. Conf. Peer-Peer Comput. (P2P), Trento, Italy, Sep. 2013, pp. 1–10.

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[5] Blockchain Technologies in the Automotive Industry - Innovation Blog, Link : https://www.e-zigurat.com/innovation-school/blog/blockchain-automotive-industry/#