

Implications for the Consumer Electronics Industry at the advent of Blockchain Technology

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ABSTRACT

Blockchain technology is at the verge of revolutionizing digital aspects of industry on a large scale. The consumer electronics industry is one the biggest and globally most diverse of all industries. By deploying blockchain technology most of the issues flagged in this paper can be resolved to a considerable extent. The literature on the applications of this technology is abundant; this paper tries to find specific solutions for the globally distributed consumer electronics industry. The solutions presented range from the issues in advertising, supply chain, provenance, food safety etc.

We have examined various pain areas like Digital Identity, Loyalty Program, Intellectual property rights, Warranty claims, Provenance and Counterfeit goods. The future scope of this paper deals with the integration of blockchain as an edifice in the merging platform of Web 3.0 that will work and act in conjunction with the field of Industry 4.0

Keywords

Blockchain, Supply Chain management, Logistics, Digital Identity, Loyalty, IPR, Warranty, Provenance

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Introduction

Pegged at over \$70 billion in the year 2019, the **Consumer Electronics Industry (CEI)** is **expected to hit the \$100 billion mark by 2023**. This promising growth trajectory can be used to introduce the multifaceted blockchain technology. Instead, IBM's survey revealed that a whopping **68% of the CEI players were apprehensive in adopting Blockchain** for the lack of a clear framework and platform. The Consumer Electronics Industry is plagued with many issues and risks owing to its Global Spread, Intense competition, new technological advances, lack of IPR protection etc. The Consumer Electronics Industry has many data procedures, documents, supply chain needs procurement and sourcing policies, advertising issues and various approvals etc.

The consumer electronics industry (CEI) can be broadly classified into the following categories of use: entertainment (TV, gaming consoles etc.), communication (mobile phones) or office products (printer and copiers). Furthermore, the home appliances section of this industry is that included refrigerators and washing machines are also part of the sales channel of the consumer electronics industry. Like every other industry the CEI is also driven by innovation with an improved

focus on blending various products into one. Eg. Smartphones these days serve the dual purpose of music player and camera etc.

The supply chain network of CEI is very vast as a single product contains parts and raw materials sourced from different regions and countries of the world. A typical smartphone has elements like Gold, silver, tungsten, copper, phosphorous and boron. These elements in a single phone depict the globally vast scale of the consumer electronics industry.

A unique feature of CEI is the different sales channel that it transacts through globally. Consider the petroleum industry; the oil is extracted in very few countries, refineries of major countries refine them and then are shipped in huge oil tankers across the globe. This is in stark contrast to the CEI where in every country major or small has a stake in the manufacturing of supply operations of this industry.

Blockchain an Introduction

All across the political, legal and economic institutions, the key element are the transactions, contracts and documents. These documented relationship forms the base of the perceived trust that form the bedrock of global economic systems. What is astounding is that despite being integration they have not joined hands for a global

indisputable documentation network. This then in turn calls for a transparent, irrefutable and trustworthy system.

In blockchain which is a distributed ledger, the data is appended on all links of the ledger in real time. Changes in one document also reflect on all entities where in then each party of the network have access to the same systems of document that is indisputable. These unique features of the blockchain form the basis for all the solutions that have been proposed in this paper for the pain areas felt in the consumer electronics industry.

Scope of this study:

CEI like any other industry is plagued by limitations and pin points that need to be addressed to drive the improvement of sales channels and eventually increase the revenue channels.

a. Unsecure Digital Identity: This refers to the Digital Identity of both the firm itself and the end consumer. As the CEI is spread globally the firms' and the consumer's data are stored at various locations with or without their consent. This may lead to serious Data Breach or Fraud.

b. Loyalty Programs: The CEI offers to its users Loyalty programs in form of some credits to retain the consumer base. These offers aren't always redeemed, owing to lack of real time credits and lack of cross functional usability of these credits.

c. Warranty Claims: As the customer satisfaction is paramount in CEI, warranty claims should be easy and user friendly. Unfortunately, this isn't the case in case of settlement of Warranty Claims.

d. Supply Chain Visibility: The Global networks that sustain CEI are very opaque when it comes to transnational supply chains and data. This hampers the industries aim to fix responsibility and culpability for the section of supply chain dealt with.

e. Provenance: The consumers now wish to understand not only what does the product do but are also interested and willing to know how the parts and elements in their device were sourced.

f. Counterfeit Goods: The IP integrity in the CEI leaves much to be desired. This is not only limited

to counterfeit end goods but also the fake parts that enter the supply chain fraudulently.

g. Undependable and tampered Advertising data: The importance of advertising in CEI is hampered by undependable and error prone data about advertisement targeting and fraudulent viewership numbers.

h. Ethical Sourcing: Amongst the various raw materials used in CEI some needs to be procured for conflict prone areas of the world. The CEI have to be vigilant that any conflict mineral does not enter their supply chain.

i. ERP and Financing: Owing to the COVID-19 situation some if not all the CEI supplier are in a precarious situation with regards to their cash on hand status. Invoice financing needs a new BCT based approach to ease the burden on CEI's suppliers and vendors.

j. IPR: The CEI is evolving at a rapid pace. The new discoveries and inventions made by the CEI needs to be protected through a rigid IPR framework to ensure that fake parts don't enter our network and that the CEI doesn't lose on the revenues and market growth the new technology promises.

These pain points and their blockchain enabled solutions are the scope of this study through supporting use cases that can be deployed in real time.

Literature Review

"Blockchain is an innovative, decentralized, and distributive state-of-the-art technology, which maintains confidentiality, integrity, and availability of all the transactions and data. It is a shared, open and distributed ledger that can help store/record data and transactions backed by a cryptographic value (Choi, 2020a) across a peer-to-peer network" (Chang et al., 2019a; Choi et al., 2019).

According to Goyat et al., 2019; Babich and Hilary, 2019 "Blockchain has an immense potential to transform every step of SC, from raw materials procurement to distribution to the consumers". Chang et al. say that while there have been many successful implementations of blockchain technology, there still is a barrier with respect to usability, security and privacy concerns.

Cai et al., 2020 argues that “Along with transforming SCs of various sectors, it also helps improving the functionality and security of current digital platforms () including Internet of Things (IoTs) and other Industry 4.0 related technologies. Every industry has varied needs with respect to their privacy and security control.”

Furthermore, the seminal paper by Infosys argues that the implications for the inclusion of the blockchain technology in ERP can open up new doors for technological advancement in the field o ERP that has been stagnant for many years.

Blockchain Technology for Consumer Electronics Industry:

1. Unsecured Digital Identities:

As all the technologies are mobbing more and more towards the cyber sphere, the importance of secured digital identities can't be ignored. Also, in this digital era when their consumers are transacting through ecommerce websites and paying through online portals the need for secure digital identity is paramount.

Digital Identity as defined by the International Telecommunications union is as “a digital representation of the information known about a specific individual, group or organization”. This includes every digital identifiers a person possess online, be it email id, ORCID, debit/credit details etc.

The biggest issue is that this identity is not uniform, varies greatly across industries for the same person. Digital identity is the amalgamation if the personal and digital form of the identities of the person.

The data breaches in Yahoo and Equifax have also demonstrated that the companies holding your digital identities not only have the data and also the privilege of what you can get in the digital identity.

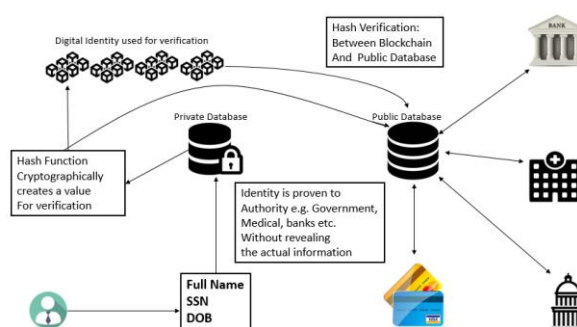
Zero knowledge proof:

If a new applicant for a credit card wants to convince that he has sufficient income that would permit him the overdraft limit he/she have to produce their pay checks for the months. But these payslips will reveal far more than what the bank wants to know. To solve this the concept of zero knowledge proof can be deployed. IN this a centralized location stores all the qualifiers of a

person's digital identity and gives the response as a yes/no answer.

This means that if the applicant wants to prove that his monthly income is more than Rs 1 lakh per month the centralized ledger would confirm without any doubt the yes or no of that answer. We can implement the blockchain technology for the same and the digital identity would be impossible to forge or change without the owner's knowing.

The following figure depicts a typical zero knowledge proof enabled Digital Identity:



2. Blockchain for Loyalty Programs:

While loyalty programs in CEI have been there for many decades now, the data paints a grim picture. Only 25% of the users are satisfied with the level of effort to earn the reward and 33% have difficulty in redeeming the awards of loyalty. Ideally these loyalty points should be monetized and be usable across different merchants.

Within a blockchain enabled group of companies, a customer would be able to transact the loyalty points across different companies.

Say, if he buys the gaming console from company A and earns loyalty points then he can access the company B website which is integrated with company A through blockchain, can easily buy a Bluetooth speaker from the company B by using the points earned from company A.

3. Blockchain for warranty claims:

CEI is driven by two aspects. One, the complicated globally distributed supply chain networks and second, the consumer satisfaction. Warranty is at the junction of both of them. It seems primarily that the warranty claims process in CEI is a simple process and does not need blockchain but that can be untrue.

Fake claims and fake products waste a lot of time of the companies while processing the warranty claims.

Using a serial number through blockchain a company can create a seal that cannot be breached in any circumstance. This can be verified through blockchain based apps at the disposal of consumer and retailer to match the purchase record. When any consumer claims warranty that can be verified clearly and they have proof that they claim that they are setting is not fake.

4. Blockchain and Supply Chains:

The biggest problems being faced by the Supply chains is the lack of provenance and accurate documentation.

Even in today's digitized world the paperwork can amount to half of the transportation costs. A study has revealed that over 87% of seafood is mislabelled all of the time. Blockchain in this case can act as the ledger of the single source of truth for asset management, procurement, life cycle management, logistics and fraud prevention.

Food Safety:

Retailer and suppliers are searching for new avenues of marking and documenting food safety, but this has turned difficult as the supply chains have become more and more competitive and complex.

Temperature sensors attached to the products only tell you half the story. To mitigate this each event in the critical tracking event (CTE) like pallets, lading, and exit and enter facility is also recorded on the blockchain. The only critical point here would be to ensure that the data points are not continuously appended to the blockchain as it may slow down the systems but only transmit temperature excursions and CTEs. The more granular the measurement the more pinpointed solutions will be.

Counterfeit Goods:

In the CEI fake parts cause a loss of \$100 billion annually. This happens because companies are compelled to work in the dark as the data is fragmented and they don't or can't know if a single small part in their supply chain is legal or not. Blockchain solution for this are fairly simple and can be implemented easily.

5. Responsible Sourcing:

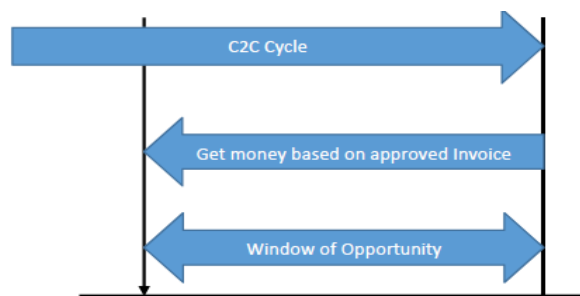
Since mining of minerals is the most initial process for the manufacturing of the consumer electronics industry and especially smartphones. Some of the rare earth metals are only found in very few African countries. For the geopolitical reasons these mines might fall into the hands of rebels and non-state actors; miners are often exploited.

Furthermore, the Dodd's-Frank act mandates that if any companies have used any conflict minerals and prove their sourcing and provenance in front of the government authorities. The Circular protocol deals with this problem by deploying blockchain based facial recognition that can enable end to end provenance records thereby helping companies in the Dodd's-Frank compliance.

6. Supply chain Financing (SCF):

The basis SCF is the faster proceeding of Supply chain documents that can be used to produce the invoice and its subsequent factoring. A blockchain system with the invoice, incoterms and the bills of lading would ensure that the invoice is 'picked-up' sooner. This in turn will give more time for its financing. If this can be achieved then a clear straight through process would be achieved thereby reducing the overdraft limit for the concerning parties.

Furthermore, in many cases the buyer is not known by the financing parties (Banks). This nature of the blockchain technology will mean that we can get a strong 'promise-to-pay' from the consumer. To be valid, the invoice would be digitally signed which forms basis of blockchain network.



Future Scope:

The implications of Web 3.0 is the basis for the implication and importance of Blockchain as a trailblazing technology.

1. Digitization of all assets: The advent of blockchain would herald a new world where all documents would be digitized.
2. Agreement automation: All the agreements through blockchain enabled smart contracts would be enabled that will be executed only when all conditions are met; thereby reducing the chances of fraud.
3. Interoperability: Web 3.0 would mean that all the data would be interoperable without needing to be on a specific platform. We won't have to worry about only a single device being accessible to Web 2.0 and not others.

Limitations:

Like in any other adoption, technological or otherwise, its potential ROI is primary factor in final adoption decision. Simply put, **the monetary value generation is the lookout for many firms.**

Blockchain technology would allow them to do more with their current assets by providing access to applications on the Blockchain Technology that, as seen in use cases discussed earlier be of great monetary importance for them. For Capital Expenditure savings can be depicted under the following metrics:

A1	CapEx Avoided
A2	Additional Infrastructure Costs Avoided (taxes, transportation, special features and accessories, special testing)
A3	A1+A2(Total OpEx Savings)
A4	OpEx as Percentage of CapEx
A5	Total Savings

B1	Total Records
B2	Percentage of Conflicting Records
B3	Number of conflicting records that require resolution
B4	Average cost to resolve a dispute
B5	Projected reduction in conflicting records with blockchain
B6	Savings due to reduction in conflicting records

Conclusion

In case of all trailblazing technologies, it is not necessary that the first usage thought would be the final and limited use of that technology. It is only after a select group of researchers come forward with their assessment that the true potential of such technologies is understood. We see that in the usage of 3D printing being used by the aerospace companies as low cost method of making and designing prototypes and spare parts.

This report makes clear that blockchain is entering an era of wider, far reaching and more practical adoption of the Blockchain Technology for various purposes. As there is no clear way of developing the blockchain applications, similarly there is no same way of deploying them industrial usage. While Blockchain is hardly a solution to all maladies plaguing the Supply Chain networks, there is an abundance of faith in the potential of BCT for Supply Chain management ranging from 'Know your Supplier' to 'Supply Chain Visibility'. The unique feature of Blockchain is unique such that every industry finds a significant impact usage for itself in it. This especially is true for adaptation in the Financial Services sector where BCT's early association with cryptocurrencies have led to misunderstandings about BCT.

To implement and draw from the full potential of Blockchain the different stakeholders will have to overcome key challenges, starting with ecosystem fragmentation and competing priorities that make collaboration difficult. But the reward is clear: Revolution in Trust, the consumer experience, supply chain management and effectiveness of advertising.

The impact of COVID-19 has been adverse, but the extent of the adversity has not been same across all sector. The post COVID-19 lockdown had a negative impact on the cash on hand status and we can expect a significant slowdown in technology spending. With the usage of contact tracing apps in the midst of us and the privacy implications we have to strike a right balance between data gathering and protection of privacy.

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