IoT E-business Model: Redesign Old Business Models

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Abstract— **This article attempts to provide an IoT E-business Model design overview. This design will make an IoT E-business Model with a basis of a traditional business system built by the following concepts. First, because the IoT E-business Model is based on traditional e-commerce that thrives on the Internet, conducting a systematic analysis of the conventional electronic business. Second, to modify and optimize each part according to the IoT feature, all physical devices and entities will have the function and data as a web service, integrating devices and services.**

Keywords—IoT, Business model, Smart contract

I. INTRODUCTION

As information technology develops, there is a network that can connect all kinds of things from objects to humans through addressing schemes that can communicate from human to human and work together with other people to achieve the same goals in mind, which is called the Internet of Things (IoT) [1]. IoT systems can share information about goods in detail starting from manufacturing, transportation, and consumption, and sharing various things about other people's lives [2].

The Development of information technology and the internet are also improving how business systems operate[3]–[17]. The business system which initially had the character of conventional buying and selling where sellers and buyers had to meet face to face to make transactions has developed into an internet sales system that does not require sellers and buyers to make a transaction face-to-face, but simply by placing an order via the internet and paying via bank transfer you can get desired goods, this is usually called e-commerce [7].

Due to the development of e-business in terms of theory and practice[8]–[11], it can be said that the e-business model has become a very important model throughout the world. However, if this e-business model is remodeled according to the IoT concept, there will be many obstacles and problems[12].

Motivated by this, this article tries to provide an overview of IoT-based e-business design. This design will create a new traditional business system that builds an IoT commerce system with a concept design as follows. First, the IoT E-commerce system is based on traditional e-commerce that developed on the Internet, by carrying out a systematic analysis of conventional electronic businesses. Second, to modify and optimize each part according to IoT features, all devices and physical entities will have functions and data as web services, which integrate devices and services [2].

II. DISCUSSION

A. Decentralized Autonomous Corporations (DAC)

DAC (decentralized automation company) like companies in general is a type of company that acts and has activities for all practical purposes[13]–[16]. But the difference is, DAC is decentralized and not owned by anyone [2]. While people can benefit from DAC, that is the handiest part of the mechanisms that help it and has not nothing to do with its decentralized nature. the second factor is the nature of automation. the biggest distinction between DAC and traditional groups is that DAC can make choices on its own without the help of others. This is also an advantage of applying the DAC concept to IoT [2]. We can assign fundamental rules to devices and use machine-gaining knowledge of strategies to create them automatically in IoT business. last but no longer least, as an unbiased monetary entity, the most distinguishing difference between DAC and traditional software programs is that DAC includes some kind of inner property that is precious in a few manners. The sharing mechanism allows profit sharing for shareowners. DAC is the next generation of corporations and cryptocurrency is the only way to transact with these companies.

Cryptocurrency is an auto-self-sufficient, encrypted electronic foreign money. Due to the fact cryptocurrency is not issued with the aid of any state or organization, cryptocurrency customers no longer worry approximately their account being closed or currency depreciation as a result of extra cash revealed through the printing of money. tracking by way of anybody is one of the mechanisms found out by using Blockchain. Blockchain record all transaction and is encoded in a unique record of data. Additionally, customers or users throughout the internet have copies of the data blockchain, unable to falsify transaction statistics or account balances until the computer's processing power exceeds 51% of the entire community power[2]. The emergence of cryptocurrency created a technology of decentralization. however crypto currency money isn't only the handiest currency, but also a protocol, network, and transaction language. That is why cryptocurrency theory and technology are the basis of DAC theory [2].

B. IoT E-business Model

The IoT E-business Model isn't like conventional business. Lots of traditional enterprises fashion cognizance of client relationships, product innovation, infrastructure management, and financial components. but the concepts and transaction modes of IoT e-commercial enterprise are completely exclusive from traditional ones. As proven in Figure 1, there are 4 modules of the IoT E-commercial
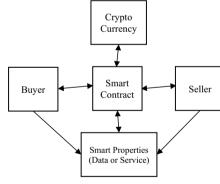
enterprise model. they're goods, commodities, simple Operation modes, and transaction modes[17].

Entities and commodities constitute the infrastructure of the IoT E-business version. Entities encompass DACs and human beings. these IoT entities aren't simply carriers of IoT commodities; They can also search for and purchase IoT merchandise in a situation with a certain condition. due to the differences between traditional business modes, there are IoT products that don't include some traditional commodities but are based totally on sensor statistics and smart properties [8]. Sensor information additionally consists of statistics processed with the aid of humans or DACs, no longer simply raw records collected with the aid of sensors. Smart properties encompass car, home, and lawn spaces, which can be controlled by electronic locks or access management structures. Similarly, energy houses (e.g. power, water, gas, and oil) that can be controlled and calculated with the aid of virtual devices can also be registered within the smart properties area [1].

Operation mode is the standard guide process of e-business IoT. All levels from pre-transaction to contract final touch should be redesigned to shape the new utility. moreover, the layout and features of the smart contract are carried out at this level. smart contracts are an essential guarantee of IoT e-commerce business transactions that will mirror every detail of the exchange. Furthermore, the capabilities, timestamps, and serial numbers of each event are recorded on the smart contract. Moreover, an entity can't unilaterally cancel a transaction once this contract has been signed via both parties and broadcast throughout the community. Transfers of encrypted money and IoT commodities correspond to the contents of smart contracts [18], [19].

Figure 1 IoT E-business Model

Unlike traditional businesses, there aren't third parties in IoT E-business. It needs a mechanism to ensure the security and effectiveness of crypto coins. Blockchain can meet these requirements, with a reliable mechanism that is executed sequentially. The first mechanism relates to (1) electronic signatures, because private keys cannot be forged users can verify their identity by signing their contracts with their private keys.; (2) Point-to-point network, E-business IoT networks are indestructible because they operate without the support of a strong central order; (3) Proof of work, preventing these users from making multiple purchases and verifying the effectiveness of transactions without a central

system; (4) distributed ledger, each crypto coin wallet contains backup transaction data for the entire network. A locking mechanism is when someone checks the existence of something and confirms its validity; (5) a hashing algorithm, every transaction is encrypted with a hashing algorithm and delivered to the newly built blockchain in real-time [18]–[20].

C. IoT E-business Model's Entities

Conventional commercial business entities consist of customers, businesses, and governments. Clients are known as users who are in a dominant position in business activities. Their consumption conduct includes demand, purchase motivation, and buying. The company has many features. For instance, their organizational shape, consumer needs, and clinical decision-making structures make them the most bendy and extensible commercial enterprise entities. In the activity of commercial enterprise, on the one hand, companies are chargeable for manufacturing and advertising commodities as manufacturers [7], [18]. However, they ought to purchase materials, components, spare elements, and similar parts from other organizations as clients. authorities regulation takes place in developed marketplace economies, especially under the conditions of a contemporary marketplace economic system. They not only have monetary company and management functions but also can participate in business engagement. Therefore, the government is an experienced customer that may take part in the activity of business without delay as a consumer (i.e. government purchasing) in addition to market control features [1].
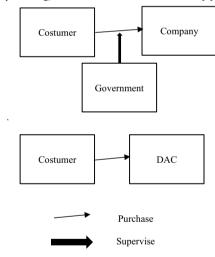

Figure 2 IoT E-business Model's Entities

Just as shown in Figure 2, there are commercial business entities inside the IoT E-business model: DAC and purchaser. On the one hand, DAC can output data from IoT as a commodity in IoT after which offers data from those records so that it can sell it on the IoT E-business platform. however, DACs must buy sensor statistics or other IoT products to hold day by day A good example is, a DAC has to purchase electricity from a DAC power technology agent that makes use of crypto coin routinely whilst there is a power scarcity.

Within the IoT E-business version, different third parties inclusive of the government cannot control the marketplace or DAC. All DACs run robotically without human intervention. The code and policies are open-supply and transparent to anyone. No human or different DAC is willing to make a deal with a closed DAC wherein the regulations no longer meet the standards. Therefore, malicious adjustments of DAC rules or DAC standards are not legitimate inside the IoT E-business Model [18], [19].

D. IoT E-business Model's Commodities

There are two classes of commodities in IoT: paid data and smart properties (virtual managed strength is also included inside the elegance of smart properties). They have so many similar features. For example, they can be transmitted at once in the community or managed by using virtual devices. Moreover, considering there aren't any traditional levels along with storage or logistics, customers can get their items or commodities at once after the deal is finished. Even though physical entities are associated with smart properties and energy properties, possession shifts may be found via token transmission or virtual manipulation [1].

Paid Data. Paid data is the primary commodity in the IoT E-business model. Currently, there are several data transactions on the internet. for instance, some websites may additionally offer paid data through their API, which is charged according to entry time. However, the types and quantities of these patterns are so limited that the benefits of a large number of IoT devices are virtually non-existent. DAC is used as the primary unit to provide paid information. DAC may be understood as a fixed gadget, that has enough CPU, memory, storage, bandwidth, and as a minimum one static IP address. The owner must set several rules so that it runs automatically [3][17][2]. These rules include what data must be provided as a commodity. What are the costs for the commodity? How does it purchase raw data and energy to maintain its daily operations?

DAC's working guidelines are completely open and obvious, which means that the info on paid data (i.e. data type, sampling price, accuracy, vicinity, and other information), rate, and purchasing patterns are open to anyone. Like a vending system, if the user agrees to the trade rules, he'll get the commodity after paying the bill. for the reason that DAC owners make the rules for it, they are responsible for the commodity. however, as soon as the policies are set, the owner cannot alter them [3].

The cost of paid data is tough to evaluate. Paid data prices come from the method of collection, storage, distribution, and so on. Even though the hardware and software programs involved in this degree are smooth to calculate, the real cost of the information is hard to evaluate. Because the value of paid data depends on how a great deal of profit the customer can get. In other words, the cost of data processed from the equal raw data however for different purposes might be distinctive. As a result, the cost of paid data must be assessed in phrases of market value [2].

Smart properties. Smart properties use smart contacts to control asset ownership via blockchain. Examples consist of physical belongings (e.g. automobiles, parking lots, and homes), non-physical property, and power (e.g. energy, oil, and gasoline) that can be controlled by virtual gadgets. The advantage of smart properties is that they can limit fraud and brokerage fees; Apart from completing several transactions

that are impossible to occur in conditions where trust is low [2].

In truth, presently there are numerous prototypes of smart properties, such as cars with anti-robbery structures so that their bodily keys are geared up with higher anti-robbery structures to ensure that the appropriate key can begin the engine. Moreover, a few smartphones use a password login system to make sure that the right user with the right keys can liberate the device. However, the ability of smart properties is some distance from what has evolved formerly. In the instance above, the master key's typically stored in a physical storage (e.g. automobile keys or SIM card), which is hard to transfer or manage. Blockchain has modified this case so that the transformation of ownership of smart properties may be achieved in the Network[18].

In terms of practical use, smart properties' ownership can be reflected in the process of opening controllers (for example door locks, car keys, water meters, and electricity meters). Traditional keys consisting of electric-powered car keys or single RFID/NFC cards can't trade user possession or use in real-time [2]. Within the IoT E-business model, we can use a mobile device prepared with an NFC module as a provider, and use an APP based on blockchain to realize the transfer of possession or use permissions. So that later the owner can manipulate smart properties via a cell device prepared with an NFC module and positive APPs.

E. IoT E-business Model's Operation Mode

As Figure 3 shows, there are four levels in the traditional business operation mode. they're the pre-transaction guidance level, transaction negotiation level, contract registration, contract achievement, and contract fulfillment. In this subsection, after analyzing the traditional and IoT E-business Models and making a comparison between the two [2].
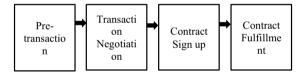

Figure 3 IoT E-business Model's Operation Mode

Pre-transaction preparation stage. This level consists of the practice of all contributors in the transaction. In conventional business, customers must prepare the money, make plans to purchase, carry out repeated market investigations and analyses, and study various types, quantities, specifications, prices, and modes of transaction commodities. sellers should hold conferences on their commodities and put them on the market. In addition, they must conduct complete marketplace investigations and provide you with numerous sales techniques so you can understand the client's marketplace. Other participants such as intermediaries, financial institutions, banks, credit card companies, customs systems, insurance companies, and transportation companies must also prepare for appropriate trade [7].

The reason that transaction mode is centralized within the IoT E-business model, it does not require the participation of financial institutions and banks. The pre-transaction level in the IoT E-business model most effective includes the purchaser and vendor advertising the goods. On the one hand, dealers should put it up for sale their items. more particularly, they invent unique statistics, legal terms, charges, and

product kinds (e.g., paid data and smart properties) that exist within the IoT E-business network. However, customers can look for commodities on this network and make comparisons to find what they want. Or they could get precise commodities via coming into filter-out criteria. So, they will understand the commodities needed and may start transactions [2].

Negotiation stage. The negotiation stage begins right after the vendor and purchaser recognize the specified records for the commodity. In conventional business, after the vendor and buyer reach an agreement through negotiation and session, they use the agreement to jot down targeted instructions including rights, responsibilities, commodity records and claims, and many others.

Contract signing stage. Contracts are signed by way of electronic data interchange (EDI) in conventional electronic commercial business, and virtual signatures are used to guarantee legal effect. Different coverage measures include negotiation logs and documents. This electronic evidence may be used to arbitrate legal disputes in transactions. However, this proof should be saved on a server controlled with the aid of a third party [7].

since there's no third party inside the IoT E-business model, traditional strategies will not work. Decentralized smart contracts may be used to remedy the problems. On the other hand, the key function of smart contracts is that they're a decentralized system handy to everyone, requiring no intermediaries. Then again, they are computer programs that could robotically perform the phrases of the contract. In essence, those automatic contracts work like any other computer program's if-then reports. In other words, whilst a programmed circumstance is induced, the smart contract executes the corresponding contract clause [1].

By the smart contract, cryptocurrency is used as a way of payment. It would defeat the cause of smart contracts if banks still had to manually authorize the discharge and transfer of money. Banks can control trades at the source and consequently, smart contract execution could be useless. but crypto currency itself is a computer program, smart contracts can interact with it. In other phrases, computer programs can trigger payments [2]. On account that smart contract execution is completely automated, the terms and conditions inside the smart contract should be triggerable.

Contract fulfillment stage. This level starts after the buyer and vendor have completed all contract procedures. In traditional business, dealers ought to put together items and issues such as customs duties, insurance, proof, and credit. After that, they deliver the goods to the transportation company to finish different obligations consisting of packing, shipping, and transportation. Shoppers have to ship their money to dealers through banks and different financial establishments after confirming the products. They can inform a third party to send their money to the seller. Then the vendor will make a certification and ticket after they verify the money has been transferred. After that, the complete transaction is completed [2].

Traditional contracts haven't any impact on the IoT E-business model. because DAC is independent and no particular group or man or woman will act as a third party. Even though smart contracts can cause events according to certain situations routinely, there may be no third party to keep them. Even though those smart contracts are saved via

a few corporations, there is no assurance that their contents will not be modified or deleted by someone. therefore, it's miles important to make it public.

F. IoT E-business Model's Transaction Mode

The traditional mode of E-business transactions is the digitization of price range and economic method if you want to circulate on the network. The advantage of the IoT E-business model is its decentralized feature, which separates it from the management and influence of conventional financial institutions. but, buying and selling between crypto coins and commodities presently relies on third-party structures so the ability of decentralized capabilities can't be completed. Considering that trading among currencies and commodities is real-time and automated within the IoT E-business model, it has to be without a doubt decentralized. therefore, there is IoTcoin, which may achieve economic cost from the crypto coin community technically as a way to gain P2P trading IoT E-business model. Moreover, IoTcoin is specifically designed to be suitable for IoT commodity transactions, especially for DAC and smart properties [2].

Payment and exchange are two ways of transactions in IoT E-business. Most commonly, it can be applied to purchasing services and commodities in IoT. For example, one individual needs to buy a commodity from DAC. He must sign a smart contract with the DAC and pay crypto coins for the network. Alternatively can be applied to smart property transactions. for instance, B needs to buy a car from A. First, they ought to design a smart contract, which contains specific transaction terms such as how many crypto coins B has to pay to trade one IoTcoin. 2nd, each party confirms this contract and submits it to the blockchain. Subsequently, the contract will take impact and each party will get what they need [2].
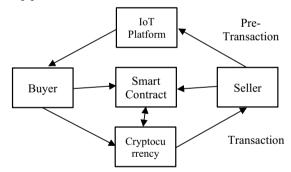

Figure 4 Transaction Mode of IoT E-business Model

III.   CONCLUSION

Due to the development of e-business in terms of theory and practice, it can be said that the e-business model has become a very important model throughout the world. However, if this e-business model is remodeled according to the IoT concept, there will be many obstacles and problems.

The IoT E-business Model isn't like conventional business. Lots of traditional enterprises fashion cognizance of client relationships, product innovation, infrastructure management, and financial components. but the concepts and transaction modes of IoT e-commercial enterprise are completely exclusive from traditional ones. There are 4 modules of the IoT E-commercial enterprise model. they're goods, commodities, simple Operation modes, and transaction modes.

Entities and commodities constitute the infrastructure of the IoT e-commerce business model. Entities include DACs and humans. those IoT entities aren't just companies of IoT commodities; They also can search and purchase IoT products consistent with certain situations automatically.

Operation mode is the rule of the e-business IoT process. All tiers from pre-transaction to completion of the contract need to be redesigned to be in the shape of the brand new software. moreover, the design and functions of the smart contract are carried out to this degree. smart contracts are a vital guarantee of IoT E-business transactions so that they will mirror each element of trade.

Unlike traditional businesses, there aren't other parties in IoT E-business. Another mechanism is needed to ensure the effectiveness and security of using crypto coins and IoT coins. These requirements can be met with the use of blockchain technology, with a reliable mechanism that is executed sequentially. The first mechanism relates to (1) electronic signatures, because private keys cannot be forged users can verify their identity by signing their contracts with their private keys.; (2) Point-to-point network, E-business IoT networks are indestructible because they operate without the support of a strong central order; (3) Proof of work, preventing these users from making multiple purchases and verifying the effectiveness of transactions without a central system; (4) distributed ledger, each crypto coin wallet contains backup transaction data for the entire network. A locking mechanism is when someone checks the existence of something and confirms its validity; (5) a hashing algorithm, every transaction is encrypted with a hashing algorithm and delivered to the newly built blockchain in real-time.

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