The future of B2B: blockchains, smart contracts and cryptocurrencies

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Abstract
Advances in communications technology such as the Internet led to the development of the electronic business-to-business (B2B) marketplaces, where different sides of the market are matched together for exchange. Nonetheless, despite the technological innovation electronic markets still suffer from the age-old problems related to trust development, opportunism, quality shirking, as well as the prolonged and costly payment processes. The article addresses whether blockchains, smart contracts, and cryptocurrencies – recent digital inventions supplied by cryptography – are able to overcome some of the problems inherent in the current online platforms. The author explores the potential benefits of these transformational technologies and argues that their adoption for the exchange in B2B electronic markets will have positive impact on the future shape of the B2B commerce, market share and value.

Introduction

The emergence and the mass adoption of the Internet in the 1990s dramatically changed business-to-business commerce. Instantaneous communication and data flow allowed for linking a large numbers of buyers and sellers through business-to-business electronic marketplaces. These new B2B platforms reduced transaction costs, improved customer accessibility, offered greater liquidity and scalability (Wise and Morrison, 2000). Overall, embracing new technology to transact business on the Internet seemed to generate economic benefits to all stakeholders in the business-to-business environment.

In order for the electronic B2B marketplace to be operational, it must rely on the intermediary (market maker) who brings together multiple buyers and sellers to facilitate transactions. Because trust is fundamental for valued relationships in B2B markets in general (Zhang, Netzer, and Ansari, 2014), and for B2B electronic markets in particular (Grewal, Chakravarty, and Saini, 2010), market maker acts a trusted third party who safeguards against fraud and the misuse of trust among market participants. Further, it keeps the registry of the transactions recorded in the server-based system and ensures integrity of that system. Market maker charges transaction fees to cover its operating expenditures (computer hardware, personnel, etc.), and depends on the interbank payment networks for settling domestic and international transactions.

However, because market maker controls the infrastructure, information flow, and the processes governing the electronic market, its actions may run counter to the best interests of other market participants (Grewal, Chakravarty, and Saini, 2010). For example, it may get involved in the exchange on the buyer's or seller's side using valuable information about the current state of the market and trade opportunistically against other parties. Further, it may manipulate market rules to its own advantage or let other market players abuse the system. Another problem is that by design electronic markets may be inherently biased toward sellers or buyers and therefore be less attractive to either side (Kaplan and Sawhney, 2000). Likewise, vendors may want to abuse established quality procedures and opportunistically sell lower quality products than those contracted upon, especially when the control and monitoring in the e-market is weak (Wathne and Heide, 2000). Taken together, this suggests that the electronic market hinges on the trust based model, which may break down if the market maker proves to be lax or untrustworthy and exploitative. This in turn may create significant negative externalities for all other market participants and the economy as a whole.

Blockchain as a trust mechanism

Recent development of blockchain technology underpinned by the Internet promises a wide variety of benefits that supplement and extend beyond the benefits introduced by electronic B2B markets brought into existence at the turn of the century. Below I discuss the workings of the blockchain and introduce successive generations of blockchain technology together with their implications for the B2B business.

Blockchain produces trust without the trusted central authority, which is entirely eliminated from the blockchain system. As such, blockchain is not controlled by a single entity, individual or state. Blockchain can be defined as a decentralized database structured as a time sequence of packaged transactions called blocks. The database is maintained by the network of computer hardware dispersed around the globe and therefore does not have any specific geographic location.

The network is permissionless meaning that anyone with the Internet connection who wishes to become part of the network can join it at will. As a result, the network is operated by thousands of computers located globally that comprise network nodes and therefore it does not have a central point of failure. Nodes remain anonymous. Disclosing node identity (to the public or the regulator) is not necessary for establishing trust on the blockchain network. Instead, the trust is the collective outcome of the network interaction among people who do not know one another.

Blockchain is propelled by a complex reward mechanism embedded in the system. In order for the transaction to be written into the block, nodes have to verify whether the transaction is legitimate. More specifically, nodes have to ensure that the required electronic payment occurred and the currency ownership was transferred. Once nodes ensure that transactions are legitimate and validate the block, they receive a reward with a monetary value (cryptocurrency). The reward scheme incentivizes nodes to process the transactions on the blockchain by introducing competition among them, since only the first node that validates the block receives the reward. Transaction validation takes the form of finding a randomized solution to the computational puzzle by trial and error. Consequently, if each node has the same computational power, it has an equal chance of finding the solution to the puzzle and receiving a reward.

All transactions that have been validated on the blockchain since the beginning of the blockchain existence (i.e., since block 1) are stored in the electronic ledger on every node of the network. The ledger is repeatedly updated with every block creation and it is readily accessible by anyone who wants to inspect it. Borderless and transnational distribution of the ledger makes it immune to manipulation and ensures its longevity. It is worth noting that blockchain transactions are irreversible. Since, by design, it is implausible to validate a fraudulent transaction on the blockchain, there is no need for the existence of a transaction that could be reversed. This feature eliminates the need for mediating disputes and thus lowers transaction costs.

Bitcoin blockchain

Bitcoin blockchain was brought into existence by Satoshi Nakamoto in 2008. It is the oldest and most trusted blockchain in the ecosystem with around 10,000 active nodes. The blockchain is propelled by the cryptocurrency called bitcoin that was originally thought of as electronic cash used in the payment system without the trusted central authority (e.g., bank, clearing house). Bitcoin is created as a reward paid out for pooling the transaction records together, verifying their authenticity, and adding them as a block to the database (blockchain). Nodes that verify transactions and earn bitcoin are called “miners” by analogy with gold mining that requires cost and effort to extract gold used to mint new coins. By design, every ten minutes miners create a new block and new bitcoins increase the circulating bitcoin supply. It follows that, a bitcoin transaction (an electronic payment in which bitcoin is used) is approved, on average, every ten minutes. As of the time of this writing, the total supply of bitcoin was around 17 million with $8,200 price per unit. The total supply of bitcoin is capped at 21 million with the last bitcoin expected to be mined in the year 2140.

Ethereum and smart contracts

Ethereum is considered to be a second generation blockchain, as in addition to the decentralized electronic currency system with its own cryptocurrency (ether) it provides a built-in programming language. This feature, which is not fully available on Bitcoin blockchain, allows to write smart contracts that could be defined as computer applications with different terms and conditions, customized for individual needs, and self-executed if the pre-programmed conditions are met. Since the access to ethereum blockchain is permissionless any user can write any arbitrary smart contract and place it on the blockchain. Similarly, any other user with the access to the Internet is able to utilize that particular contract at will. Moreover, ethereum blockchain allows for designing a system of contracts that interact with one another towards the attainment of the desirable outcome or task. Creation and the usage of contracts must be each time validated on the ethereum network through a transaction that uses its cryptocurrency (ether). Smart contracts can be used in a variety of real-life applications including financial derivatives, asset issuance, crowdsale, prediction markets, Internet of things, decentralized exchanges, decentralized autonomous organizations, and many others.

Ripple

Ripple is a unique cryptocurrency that does not rely on anonymous and decentralized set of nodes to validate transactions. Instead, it uses a trusted set of identifiable nodes (validators) which have been selected for the task by the company that developed ripple. The set of validators can be expanded depending on the behavior of the specific nodes and their perceived quality, however, at present ripple network runs on hand-picked validators and thus resembles a system with a trusted central authority. Ripple was created to replace the obsolete cross-border interbank settlement system which is currently both slow and costly, although ripple could also be used for micropayments or electronic payments in B2B transactions. The greatest advantage of the ripple network compared to other blockchains is the ability to process secure transactions in a matter of seconds with the close to zero marginal cost of processing the payment.

Third generation blockchains

Third generation blockchains are designed to be interoperable, a dimension that introduces the ability to cross-communicate with the other blockchain networks (e.g., bitcoin, ethereum, ripple) as well as the existing legacy systems like SWIFT or Automated Clearing House (ACH) settlement standard. More concretely, interoperability allows for the flow of a specific cryptocurrency from one chain to the other, as the third generation blockchain is able to verify whether the transaction processed on a different blockchain is a legitimate one. Thus, by developing blockchain interoperability there will be no serious problem of the coexistence of multiple standards that support multiple cryptocurrencies as well as the existing fiat currencies. Currently, there exist no flawless method to escalate transactions between blockchain and the traditional banking system as the interlinks between the two are somewhat fragile. One of the most promising technologies in this arena is Cardano, which is featured as the key element of the Internet of blockchains and the Internet of value.

Decentralized B2B exchanges

I define decentralized business-to-business exchanges as electronic marketplaces where transactions are validated on the blockchain based on the contingent smart contracts using cryptocurrency as a means of payment. The term “exchange” refers to all sorts of price-setting mechanisms including auctions, reverse auctions, bid-ask systems, and others. As discussed below, decentralized B2B exchanges powered by cryptocurrencies solve the long-standing problems inherent in the current form of electronic marketplaces, which relate to trust, opportunism among the transacting parties, quality shirking, market liquidity, transaction cost, as well as the speed and security of the payment process.

Technically, the decentralized B2B exchange can be envisaged as the collection of smart contracts interacting with one another toward the optimization of the well-defined objective function under the pre-specified transactional terms and conditions. The contracts coded using a programming language are fully transparent, verifiable, and permanently written into the blockchain. The design and operation of the contracts can be achieved at minimal cost, several orders of magnitude lower than the costs of operating computer servers and personnel by the traditional online markets. Moreover, the marginal cost of improving the system by adding additional contracts to the existing set or replacing the system by a completely new one should be equally low. Smart contracts eliminate the need for the market maker who is indispensable in the existing architecture of the B2B electronic markets (Grewal, Comer, and Mehta, 2001). Likewise, blockchain exchanges which run on smart contracts do not require a trusted third party policing and monitoring the market against opportunistic players, neither do they require the integration of the inter-organizational information systems, mutual arrangements of payments, and the like (Zhou and Zhu, 2010). All transactions processes on decentralized B2B exchanges are self-executed meaning that the transmission of information, product ownership, and value takes place without the intermediary and is fully autonomous. More importantly, the price-setting process is also autonomous regardless of whether the transaction price is reached in the auction or through the bid and ask system. This model is applicable to all sorts of manufacturing and operating inputs in both horizontal and vertical B2B open markets (Kaplan and Sawhney, 2000).

Further, decentralized B2B exchanges solve the quality shirking problem as defined by Hadfield (1990). Accurate indication of the product quality produced at a firm's physical facility can be written into the blockchain in the instantaneous and permanent way, thus greatly reducing or even eliminating firm's ability to manipulate the quality standard. This information can travel throughout the supply chain from the highest level of the vertical supply network moving downstream, and include the information on the quality of the basic raw materials, technical materials, manufactured goods, etc. Because blockchain database is transparent and therefore easily verifiable, it may discipline firms against opportunistic quality cheating. As such, blockchain may serve as the quality assurance device in B2B commerce. On decentralized B2B exchanges, buyers can easily verify the quality of the transacted product ex-ante and consequently drive out quality violators out of the exchange.

Another problem plaguing online B2B commerce is linked to the low speed and high cost of payment processing as well as the considerable risk of payment fraud. The interbank transfer of funds takes from three to five business days to materialize and the cost of transfer can range from around $15 to $50 for both incoming and outgoing payments. Although some countries managed to introduce real-time transfers in domestic sovereign currencies, the value of these transactions is often capped, rendering it less attractive for businesses. Equally important, banks recently exited certain developing markets due to high volatility and challenging regulatory environment making it more difficult for B2B companies. In contrast, cryptocurrencies offer a giant leap forward with regard to the cost, speed and data integrity of the payment mechanism. All type of cryptocurrency transfers including cross-border are settled instantaneously (within seconds), the total cost of transfer is negligible, and the marginal cost of processing the additional currency unit is almost zero. For example, transferring $5 million to the poor developing country on the other side of the globe via ripple network can cost as low as a fraction of a US cent and be processed in four seconds. In addition to the processing speed and low transaction costs, cryptocurrencies offer greater transaction security. By construction, in decentralized B2B exchanges the executed trade between the bidder and the supplier is synonymous with the transfer of payment to the supplier that occurs instantaneously when triggered by that trade. Moreover, all the information about the transaction including invoicing can be immediately written into the blockchain and remain available for instant viewing by both parties. This eliminates a whole range of tedious and time consuming tasks related to billing, invoicing, and wire transfer payments. Most importantly, cryptocurrencies eliminate fraudulent activities simply by ceasing to execute manual payments on demand by the counterparty thus minimizing the risk of business email compromise. According to the recent survey conducted by JP Morgan the payments fraud reached in 2017 a record high with 78 percent of all US organizations being affected. Fraudsters typically target firms doing business with foreign suppliers or alternatively firms that regularly perform wire transfer payments. The report estimates that the total loss associated with the B2B payment fraud over the last years amounts to $5.3 billion.

Adoption of the decentralized B2B exchanges (third-generation B2B exchanges) should lead to value creation for transacting parties by substantially reducing transaction costs. First, removal of the middleman from the decentralized exchanges eliminates fees and commissions charged by the intermediary for structuring and executing orders, transaction security, and infrastructure. Second, blockchain-based exchanges do not rely on a traditional banking system for payment settling. Instead they use cryptocurrencies that offer much higher speed of transactions, greater security, and much lower cost. Cryptocurrency transactions occur directly between the currency recipient and the sender and thus do not rely on the bank network or the clearing house to validate the payment. These transactions can be processed 24/7 including weekends and holidays. Beside savings associated with lower payment processing fees for domestic purchases, transacting parties also avoid costly currency conversion fees and lengthy transfer delays. Perhaps more important, B2B businesses do not have to bear the burden of the hefty fixed costs of banking services. These costs together with bank transfer fees and untrustworthy payment infrastructure are the main reasons for the exclusion of businesses domiciled in the developing countries from the global B2B commerce. Consequently, moving transactions to the decentralized B2B exchanges should stimulate economic inclusion and incorporate less developed B2B environments into the global B2B landscape. This should then enhance firm growth and market share of the B2B players.

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