Blockchain's Roles in Fighting Corruption and Improving Public Sector Efficiency in Developing Countries

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The public sector in many developing countries suffers from bureaucratic inefficiency, corruption, and lack of accountability. This From the Editors article analyzes how blockchain-based solutions are being deployed in some countries in Latin America to improve the efficiency in public services delivery, and fight against corruption.

Blockchain's key features, such as immutability and decentralization, make this technology an effective tool to promote transparency and fight corrupt practices. From the corruption standpoint, public procurement has been one area that has received a great deal of attention. Governments worldwide spend US$9.5 trillion annually to public procurement, which is about 15% of the global gross domestic product (https://tinyurl.com/3k4x7nek). About 10%–30% of a public contract's value is lost due to corruption.[1] According to the Organization for Economic Co-operation and Development, 57% of foreign bribery cases involve public procurement contracts.[2]

The global civil society organization established to fight against corruption, Transparency International has argued that blockchain can be an effective tool to fight corruption in public procurement processes since the technology can limit fraudulent practices, such as manipulation in such processes.[3] Blockchain's shared and immutable records cannot be censored or altered by government agencies. Records of bids and public comments cannot be deleted and a vendor cannot be denied from bidding. Bids or tender offers cannot be altered once they are submitted (https://tinyurl.com/3k4x7nek).

Many international organizations have also advocated for the use of blockchain in fighting corruption in public procurement. The United Nations Office on Drugs and Crime has suggested the Kenyan government to use blockchain to fight economic crimes. Government officials in Kenya allegedly manipulate procurement procedures and systems to inflate costs for their own gains.

The country's highest offices including the vice president have been connected to scandals (https://tinyurl.com/4chnp6ha). According to Kenya's Auditor General, the country loses US$10 billion annually to corruption (https://tinyurl.com/upvy8ue9).

Blockchain also holds promise in promoting efficiency in the public sector. One such area is customs administration, which is extremely inefficient. Every international shipment involves dozens and people, and the exchange of as many as 240 copies of documents.[4] Efficiency can be greatly enhanced with the use of blockchain in customs administrations.

A number of blockchain-based solutions have been launched to address challenges related to inefficiency in public services delivery, corruption, and the lack of transparency. This From the Editors article highlights four use cases that are being deployed for such purposes in in Latin America.

INTERAMERICAN DEVELOPMENT BANK's (IDB) CADENA BLOCKCHAIN TO FACILITATE INTERNATIONAL TRADE

The World Customs Organization has developed a framework to identify secured and trusted actors, known as the Authorized Economic Operators (AEO). An importer or exporter that is an AEO can receive expedited treatment in customs and related procedures. As of 2019, about 80 countries had compiled lists of entities and certified that they meet AEO standards. Customs can focus their resources on noncertified actors.[5] The system's benefits can be maximized if customs administrations share their lists of AEOs with their counterpart agencies in other countries. Without sharing such information, exporters can get expedited treatment only in their county but not in the destination country. As of 2019,

60 mutual recognition arrangements (MRAs), which involve sharing of lists, had been signed and 40 more were being negotiated. Some of the MRAs are bilateral, which others are multilateral.

The customs administrations of Pacific Alliance member-countries Colombia, Chile, Mexico, and Peru had bilateral MRAs. The lists of AEOs change. New entities can be added and some can be removed. Customs officers send Excel files containing the data of their AEOs by emails to their counterparts usually every month. A challenge is that email systems are not secure. When entities are added or removed from the AEO, there is often a delay in communicating the list to counterpart customs agencies.

To address these challenges, the Integration and Trade Sector of the IDB teamed up with AEO program officers and IT specialists from Mexico, Peru, Chile, and Costa Rica and the U.S. multinational technology corporation Microsoft to develop a blockchain-based application called CADENA. CADENA provides information on a real-time basis to help increase transparency and trust.

CADENA is deployed on LACCHAIN, which is regional blockchain infrastructure created to promote a blockchain ecosystem in the Latin America and the Caribbean region (https://www.wto.org/english/res_e/reser_e/pres_corcuera.pdf). LACCHAIN was built and implemented by customs teams in the region to develop and strengthen their capacity. It is promoted, funded, and led by the Innovation Laboratory of the IDB but involves a global alliance of participants in the blockchain sector (https://tinyurl.com/25r2uaja).

In 2019, LACCHAIN started developing its first testnet with Quorum, which is an open-source protocol developed by JPMorgan using the Ethereum blockchain (https://tinyurl.com/y2kzs9zw). It then migrated to ConsenSys-backed, enterprise-focused Pantheon, which became Hyperledger Besu (https://www.hyperledger.org/learn/publications/lacchain-case-study).

Hyperledger Besu is an Ethereum client. That is, it implements Ethereum protocol rules, such as verifying data against the rules and keeping the network secure. Hyperledger Besu is viewed as an enterprise-friendly blockchain and can be structured for both public and private permissioned network use cases (https://www.hyperledger.org/use/besu).

COLOMBIAN GOVERNMENT's DEPLOYMENT OF ETHEREUM BLOCKCHAIN TO CONTROL CORRUPTION IN SCHOOL MEAL PROCUREMENT

In Colombia, many corrupt practices have been reported in school meal procurement. Various scandals have arisen in this program in recent years. The Colombian newspaper El Tiempo reported that chicken breasts were sold to schools at US $12 [COL $40,000 (Colombian peso)], which was about four times the price of local supermarkets.[6] In some cases, goods that are purchased are not delivered. The former mayor of the port city on Caribbean coast Cartagena was charged for illegally contracting a deal of over COL $23 million (about US $7,000). Out of 2.6 million loaves of bread that were bought, one million were never delivered to schools. Public figures and officials, and small number of food contractors have been involved in procurement frauds (https://tinyurl.com/5n9byxp8).

In an attempt to address corrupt practices in public procurement, such as the one discussed previously, the World Economic Forum (WEF) has teamed up with the IDB and the Office of the Inspector General of Colombia (Procuraduría General de Colombia) to investigate, design, and trial the use of blockchain for public procurement activities. A software proof-of-concept focused on a school meals program (Programa de Alimentación Escolar), which targets young people from low-income households was developed. A public blockchain procurement system was used to track the process of supplier selection in this program in the city of Medellín using the Ethereum blockchain (https://decrypt.co/32686/bullies-beware-Colombia-using-ethereum-protect-lunch-money).

The WEF's initial Blockchain project in Colombia focused on the contractor selection phase. The goal is to improve transparency, fairness, and competitiveness in a bidding process. A tenderer publicly commits to contract terms and selection criteria prior to eliciting bids. In this way, risks such as tailoring selection criteria after the request for proposal is published to favor specific contractors are eliminated. For vendors that are competing, a blockchain-based solution's permanent and tamper-proof bid records can ensure that a firm cannot alter submitted bids after learning new information about competing bids. An additional benefit is that by increasing the perception of fairness, blockchain-led transparency can attract more vendors to the procurement process. A set of clearly defined selection criteria would increase the possibility that an outsider can win. During the auction and vendor evaluation processes, actions and decisions are automatically recorded. These records are permanent and publicly viewable, which increases auditability. It is also possible to include a user interface, which can be used by the public to monitor actions and decisions, so that risks can be flagged in real time. These enable monitoring authorities, such as the Inspector General's Office to investigate potential corrupt activity even before an auction concludes.

ALSO IN THIS ISSUE

FEATURES

In this edition, we feature three insightful papers. In "Enabling Autonomous Teams and Continuous Deployment at Scale," Dingsøyr et al. explored lessons learned during transition from traditional program management approach to a more agile development approach involving a large team effort to develop a Norwegian labor benefit project.

Juntao Yuan, et al. addressed a novel blockchain privacy-first approach they assert will hasten the dawn of decentralized finance (DeFi). Their article "Confidential Ethereum Smart Contracts" described the inner workings of a more secure approach to blockchain management suitable for making smart contracts private.

While on the topic of blockchain influenced decentralization, Sharma et al. in "A Comparative Analysis of Consensus Algorithms for Decentralized Storage Systems" explored the added value blockchain brings to emergent decentralized storage algorithms.

COLUMNS AND DEPARTMENTS

This edition of *IT Professional's* Columns and Departments continue to enlighten and inspire.

In From the Editors, we honor award-winning author for the most popular *IT Professional* paper in 2022, Nir Kshetri.

Nir reported on "Blockchain's Roles in Fighting Corruption and Improving Public Sector Efficiency in Developing Countries." This theme fits well with two of our feature articles on the role of blockchain in decentralization.

S. Andriole, in the third of a series, further challenges the C-suite with "Questions CEOs Should Ask About Digital Technology Meeting #3." Again, we will not reveal this edition's question as not to spoil the surprise.

In a new Column on FAIR (Findable, Accessible, Interoperable, and Reusable) data, G. Strawn wrote about "Doing for Data What the Internet Did for Networking." Here, he reports on the FAIR initiative, which is gaining momentum worldwide.

In his IT Economics column, N. Kshetri examined "The Metaverse and Higher Educational Institutions." His findings, as always, are most revealing and interesting.

Last, but certainly not least, Ma et al. wrote about "An Automatic and Intelligent of Things for Future Agriculture." Using applied Artificial Intelligence techniques in an agricultural Internet of Things environment, the authors demonstrate dramatic reductions in amount of irrigation water and communications energy required to grow crops, while simultaneously decreasing crop yield-time.

Blockchain-based solutions can also be used to monitor the chosen contractor's performance. For instance, information regarding actual deliveries can be made available to key stakeholders, such as parents, teachers, enforcement officials, and the press. Their participants can be used to report meal deliveries and quality in real time. By improving observation in the delivery process and allowing stakeholders to monitor and engage, accountability of contractors can be improved.[7] By allowing the participation of diverse groups, such systems can promote informal accountability, which can improve the performance of public procurement.

BRAZILIAN GOVERNMENT's BCONNECT BLOCKCHAIN NETWORK TO ENHANCE EFFICIENCY IN CUSTOMS CLEARANCE PROCESSES

Brazil's state-run technology company Serpro has developed a blockchain network BConnect to enhance efficiency in customs clearance processes. The Special Department of Federal Revenue of Brazil, Receita Federal commissioned Serpo to develop BConnect.

BConnect ensures the integrity, authenticity, and security of customs information shared between countries that belong to the Southern Common Market or Mercado Común del Sur (MERCOSUR). It verifies the identity of those feeding information onto the platform.

Since October 2020, the network has been in operation to exchange data between Argentina, Brazil, Paraguay, and Uruguay. BConnect makes it possible to share the registration information of companies certified by the Federal Revenue as an AEO. Such companies enjoy benefits, such as facilitation of customs procedures in Brazil and other MERCOSUR member countries. For instance, if a Brazilian company wants to export to Uruguay, the fact that both of them are registered on BConnect makes vetting process easier for Uruguayan (https://tinyurl.com/mrs7c6xf).

BConnect uses Hyperledger Fabric, an open source blockchain framework hosted by The Linux Foundation. (https://tinyurl.com/8nafdruu). Hyperledger Fabric's advantages over other open blockchains include data protection and consistency, use of permissions to ensure control of members and access rights, confidential transactions (https://tinyurl.com/48wu7m37).

In the beginning BConnect mainly focused on the exchange of information from AEOs. More recently, the network has been expanded to comply with the exchange of information on customs declarations, which list the items that are in shipments when they cross international borders (https://tinyurl.com/bdyaehr5).

PERUVIAN GOVERNMENT's USE OF STAMPING.IO BLOCKCHAIN PLATFORM TO FIGHT CORRUPTION AND IMPROVE EFFICIENCY IN THE PUBLIC SECTOR

The Peruvian government has teamed up with blockchain startup Stamping.io to create a blockchain-based contract-procurement system. The goal is to create a verification system for government contracts that is resistant to frauds, such as data manipulation. It registers purchase orders from Peru Compras, which is the government agency to regulate electronic purchases. As of July 2021, 600,000 purchase orders had been managed by Stamping.io's system (https://cryptonews.net/es/news/blockchain/979013/).

Other public sector organizations in the country are also utilizing Stamping.io's syste. For instance, the Ministry of Labor and Employment Promotion uses Stamping.io's technology to issue labor certificates known as Certijoven (for people younger than 30 years) and Certidaulto (for people older than 30 years). These unique labor certificate record the holder's criminal, police, and judicial records, education, formal work experience, and other types of personal information (https://cryptonews.net/es/news/blockchain/979013/). This system allows potential employers to promptly and efficiently verify job applicants' skills and credentials. Potential employees cannot use a fake CV to get a job.

As of July 2021, Stamping.io had verified about 2 million credentials, of which 80% belonged to firms in the public entities (https://cryptonews.net/es/news/blockchain/979013/). Just like CADENA, Stamping.io is deployed on LACCHAIN (https://tinyurl.com/28t54bn7).

CONCLUSION

Blockchain can allow government agencies to fulfill their mission and responsibility in an effective manner.

Blockchain-based evidence can help promote transparency, accountability, and effectiveness and increase the perception of justice and fairness in law enforcement. Even if there is no corruption involved, blockchain-based solutions can play a key role on the pursuit of efficiency in public administration. Such benefits are especially likely to accrue from permissionless blockchains like Ethereum, such as used in Colombia's school meal procurement. Anyone can join in such blockchains, and everyone can read everything. In addition to formal control mechanisms, by facilitating the participation of diverse groups, such systems can also promote relationships, such as informal accountability.

Some limitations and challenges of blockchain systems also need to be pointed out. For instance, blockchain can present a challenge to government control over the population. For instance, in Nigeria young and tech-savvy people have been able to use cryptocurrencies to navigate a complicated and restrictive banking, and monetary system and circumvent political controls. It is also important to note that while blockchain systems are secure; their data—like other databases—are only as accurate as what is entered. Blockchain can increase transparency and make it difficult or impossible for corrupt officials to alter the records after they are on the blockchain. Nonetheless, blockchain cannot address corrupt practices involving how data are entered in the ledger.

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