

Blockchain in Cities

RESTORING TRUST AND
TRANSPARENCY IN DIGITAL
TRANSACTIONS

ABOUT THE NATIONAL LEAGUE OF CITIES

The National League of Cities (NLC) is the nation's leading advocacy organization devoted to strengthening and promoting cities as centers of opportunity, leadership, and governance. Through its membership and partnerships with state municipal leagues, NLC serves as a resource and advocate for more than 19,000 cities and towns and more than 218 million Americans. NLC's Center for City Solutions provides research and analysis on key topics and trends important to cities, creative solutions to improve the quality of life in communities, inspiration and ideas for local officials to use in tackling tough issues, and opportunities for city leaders to connect with peers, share experiences, and learn about innovative approaches in cities.

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DIGITAL TRANSACTIONS



CENTER FOR CITY SOLUTIONS

Table of Contents

10	Introduction
12	What is Blockchain?
16	Opportunities for Smart Cities
17	Opportunities for Governance
22	Challenges and Barriers
25	Key Takeaways for City Leaders



Introduction



Trust provides the foundation of any relationship whether it's between individuals, within the public sector or in the commercial realm.

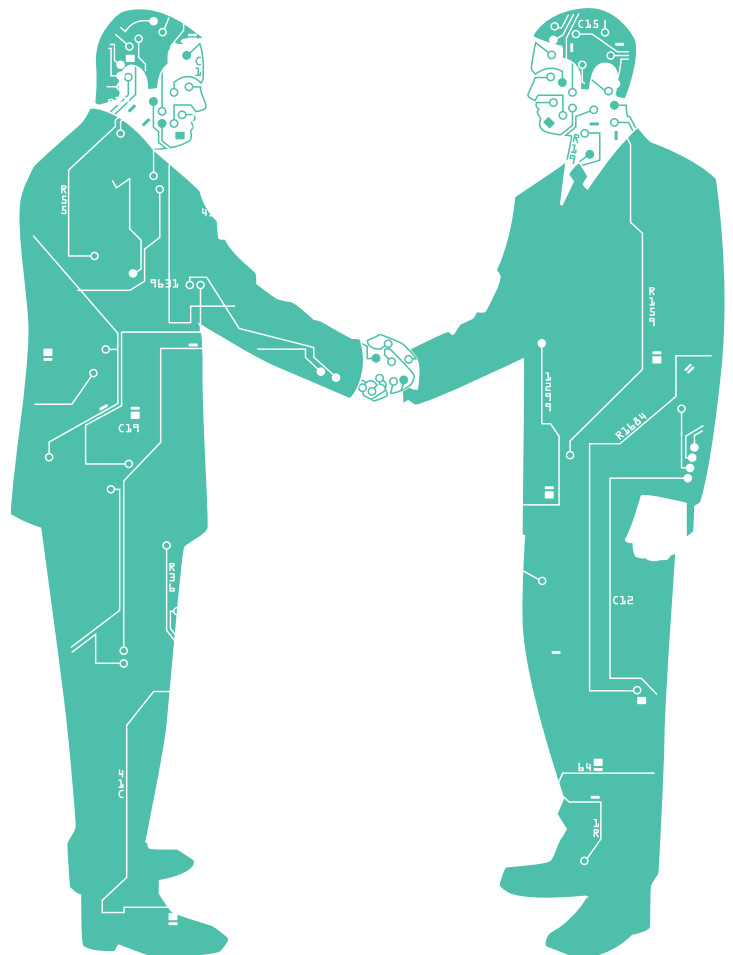


Public trust in American lawmakers (particularly at the national level), elections and democratic institutions has plummeted in recent years. While there are many contributing factors, the explosion of digital information, digital misinformation and outright abuse has played a major role in this downward trend. To restore confidence in the core tenets of our society, leaders need solutions tailored to an increasingly digital world. We believe that blockchain technology can be the foundation of many of those solutions.

The internet is often described as a “network of networks,” or a connection between hundreds of thousands of interconnected networks linking hundreds of millions of computers worldwide.¹ However, the internet has evolved into an irreplaceable worldwide communication platform. Blockchain has the potential to further innovate all of the transactions we make — whether financial, legal or municipal.

NLC’s Center for City Solutions wants to position city leaders to understand and embrace the new blockchain-powered technologies that can optimize everyday tasks and interactions. This whitepaper explores the developing blockchain opportunities for cities — voting, real estate, transportation, energy, water

management and more — and aims to broaden the discussion beyond current cryptocurrency trends. In addition, the report highlights opportunities for local governments already taking steps to utilize blockchain to lower their costs, improve efficiency and create a framework to accelerate innovation, access and accountability in public management.



What is Blockchain?

The background is a solid blue color with a repeating pattern of white and gold cubes. The cubes are arranged in a grid-like fashion, with some cubes highlighted in gold. The overall effect is a digital, geometric pattern that suggests a network or data structure.

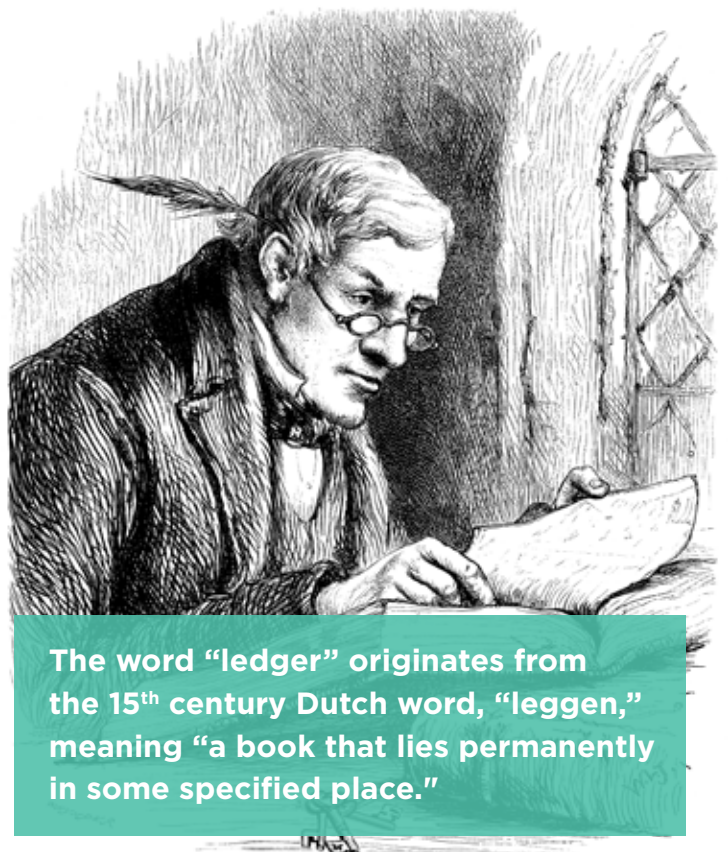
There is no universally agreed-upon definition for blockchain.



However, many of the best definitions emphasize a public, digital, chronological and distributed ledger for transactions.^{2 3} The word “ledger” originates from the 15th century Dutch word, “leggen,” meaning “a book that lies permanently in some specified place.”⁴ As the official log for all incoming and outgoing transactions, the ledger was always right due to the vested interest of every stakeholder, but also inconvenient. In contrast to the historical type of hard-copy ledger, blockchain’s distributed ledger — meaning that it is based on input from independent sources contributing data into a single, shared system — is transparent, incorruptible and accessible from anywhere. Anything digitally represented can be transferred in peer-verified blocks of information which are chronologically linked together.

Blockchain is a shared database or distributed ledger, located permanently online for anything represented digitally, such as rights, goods and property.⁵ Through enhanced trust, consensus and autonomy, blockchain brings widespread decentralization. This is a departure from the traditional role that centralized intermediaries or entities — such as banks — played to manage our valuable transfers. Its inherent transparency promotes relationships and builds confidence.

The internet has increasingly become an advantageous platform for misinformation and malicious activities like identity theft, phishing scams and hacking. Transactions that utilize a blockchain are safe, instant and have little or no transaction costs. Cities that embrace and incorporate this technology into their governance will be laying a foundation for an increasingly digitized future.



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How Does Blockchain Work?

In the early days of the internet, few people could have predicted the magnitude of the disruption it would cause and the pivotal role it would play in globalization. Some experts say blockchain will potentially change the nature and security of all interactions of value. Because blockchain has large implications for individuals, it will have even larger ramifications for cities. Imagine an anonymous “smart” spreadsheet listing and time-stamping each new bill paid, purchase made, vote cast and credit earned. In order to transfer value from one spreadsheet to another, a trusted third party verifies both spreadsheets and ownership of the asset, its transfer and its deduction from the payer’s spreadsheet. The blockchain is a copy of this third party’s master ledger, with both accounts on it, held by all three parties. Blockchain will empower cities to innovate how they work with local businesses, and invest in and improve efficiencies across many areas, such as transportation, energy and voting. Beyond city operations, blockchain promises to innovate the way we start businesses, structure investments and account for wealth creation and exchanges. Cities stand to benefit not just from increased efficiencies with lower costs, but also from greater economic integration and participation.

Potential Benefits

Accuracy and accountability: The blockchain ledger is verified using a type of consensus (this varies by platform) and allows for separate entities to transact without an intermediary because both

have a constantly updated copy of this master ledger. Once a change is recorded, it cannot be edited or erased. Removing the need for intermediary institutions when exchanging any digital asset holds major consequences for our present institutions. The word ‘immutable’ is often used to describe blockchain because all transactions are linked and rely on the others to be correct.⁶

Autonomy in procurement: Imagine wanting to purchase a specific exotic flower native to South America. You find a vendor near you who claims to sell this flower once a year. Searching the internet for more information, you discover that the flower the vendor wants to sell you appears identical in color and shape to the one you were looking for, but is described as having an unpleasant odor. This makes you wonder if it’s really the same flower that you had originally wanted from South America. At the market you use your phone or device to access the provided blockchain ledger, which confirms the Peruvian origin of the seeds, the name of the plant, the plant’s growth patterns, watering schedule, harvest date and the method used to ship them to your vendor. Each of these timestamps is inherently confirmed by third party nurseries, farms and cargo planes. Instead of blindly trusting the local vendor you can make your purchase autonomously, using the internet and blockchain to do so with an unbiased consensus of qualified peers.

Autonomy for individuals: Thanks to blockchain, those who own and generate data have renewed control of its use. Imagine your health insurer offering to discount your health plan in exchange

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for the use of anonymized health records for research purposes. Individuals could rent out their personal data for specific purposes and with specified time limits. The moment the transaction is agreed upon by both parties, the data and corresponding payment would be instant and online, with the data being automatically erased on a set date. Empowering consumers with control over their personal data in a secure and self-enforcing framework, like in this example, helps to secure the collection, use and value of data. Blockchain enables this type of autonomy and confidence in giving consumers an increased ability to handle — and potentially profit from — their own data.

How Blockchain Can Help Cities

The problem: Cities today operate in an environment where residents have low trust in government, yet high expectations. Community activism and engagement are on the rise as those residents become more determined

that their local governments should be responsive and flexible and provide tailored responses to residents' individual concerns and preferences. Blockchain can help deliver on expectations like these for community members, while offering communities a higher level of autonomy and control.

The benefits: Blockchain technology has the potential to revolutionize public service delivery and operation, making it more efficient, flexible and transparent. Although Blockchain is still an emerging technology, cities that start exploring opportunities now to become a blockchain partner will help guide the process to incorporate the needs and concerns of local operations. Cities have the potential to realize greater efficiency thanks to this technology, as well as other benefits, including streamlined coordination across departments and between public and private entities.

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Opportunities for Smart Cities



Americans have supercomputers in their pockets, on their wrists, in their cars and in their home appliances.

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Internet usage is at an all-time high, with 89 percent of the population having access in 2018, as compared to 52 percent in 2000.⁷ According to the Pew Research Center, nearly 90 percent of American adults have access to the internet, and more than three-fourths of the population own smartphones.⁸ As Americans more readily consume “smart” systems and applications, it’s obvious that they are ready for “smart cities.” It is imperative for cities of all sizes to build infrastructure that mirrors the growth and progress of their residents in order to take advantage of the advanced efficiencies of online systems. Blockchain will empower a city’s residents to make more informed choices that have the potential to create value for all involved.

Leveraging Big Data

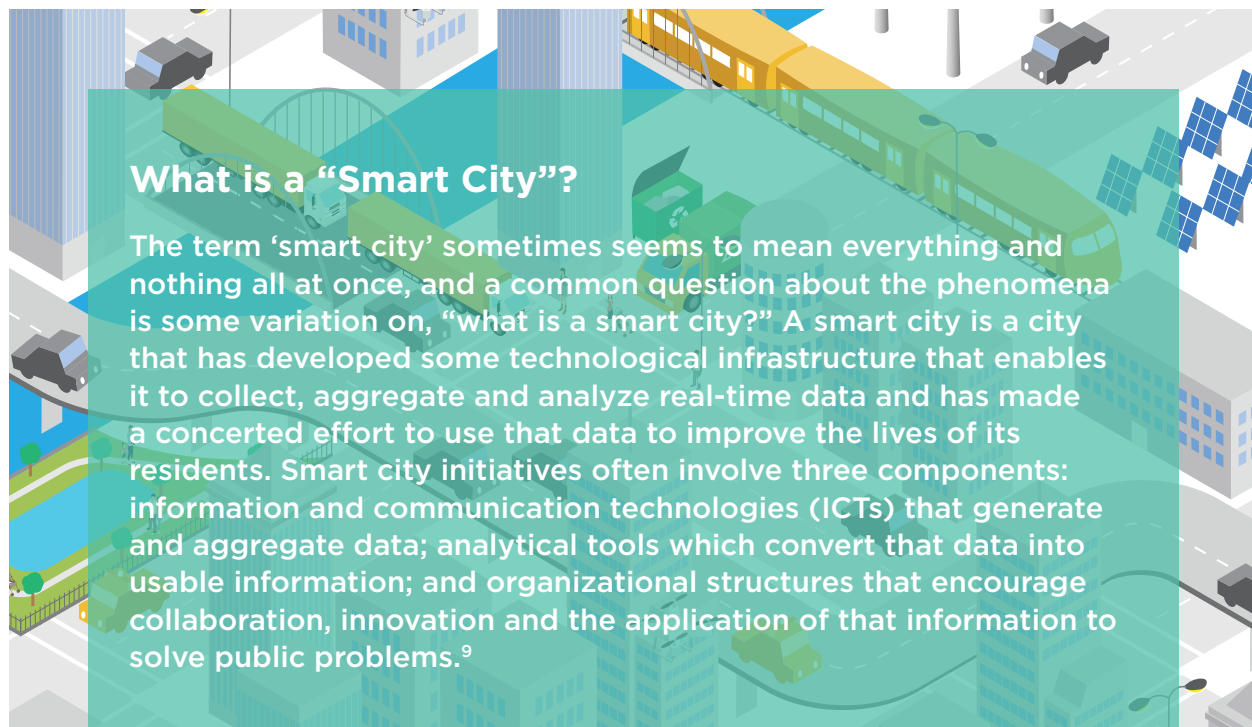
Declining costs of electronic equipment like sensors and processors, and improved wireless broadband connections have accelerated the feasibility of smart cities, making it possible for municipalities to collect more significant data related to many kinds of transactions. Collecting data from all of these various sources can mean more precise solutions and policies to get at the root of an issue. The availability of increasingly diverse city data, and the capacity of cities to systematically evaluate their goals,

creates an opportunity to present solutions that benefit both residents and local government administrations. For instance, moving city infrastructure data onto the blockchain ledger could streamline and improve municipal operations for the city and improve service delivery for the resident. Open data policies like blockchain stimulate local innovators, like software developers, to find patterns in the data. These patterns can lead to development of solutions that offer conveniences and better public services for the residents who depend on them.

Blockchain can increase the speed of public services as well as widen their capabilities and in some cases even reduce costs. From the distribution of government benefits to transportation, alternative energy and even healthcare, blockchain offers exciting possibilities, some of which are outlined in the following section of this report.

Digital inclusion and social impact:

For the nation’s poorest individuals, technological advances like blockchain will pose both benefits and challenges. Nine million American households (or 7%) don’t use banks or other financial institutions to manage or save money. Another 24.5 million (nearly 20 %) of American households are underbanked



and 9 million American households are unbanked as estimated by the Federal Deposit Insurance Corporation (FDIC).¹⁰ Some choose this lifestyle out of distrust of institutions while others cite excessive fees as reasons why they choose not to use banks. Companies focused on social impact are using blockchain to bring solutions to those who want to use a bank, but for various reasons cannot.

For instance, New York, NY based tech company Blockchain for Change, Inc. has introduced a blockchain-powered application that will consolidate government and social benefits for low-income and underserved people. The American social security system requires physical documentation that is oftentimes impossible to keep track of when an individual is homeless, transitioning or reentering society. Jason Kaplan is the

company’s general counsel and director of policy. He sees blockchain as a “choice architect” and one that has the potential to bring greater financial inclusion into the modern economy. The company’s application Fummi was developed to use blockchain to decrease errors and help underserved residents gain government-issued identification and make better use of city services and benefits in general.

For those who are low-income or homeless, lack of identification is a serious issue. According to Kaplan, a virtual wallet with a unique ID establishes a single immutable profile for the residents. Consequently, those who suffer from poor or no credit can build a chronological history of transactions and deposits without the extraction of prohibitive fees, and minimum balance requirements. This transactional history

can then be leveraged to access non-predatory micro-loans and other financial services. It also allows social service agencies to collect basic data points for individuals without permanent addresses.

Cryptocurrency: Soon cryptocurrency will become just as ubiquitous as credit and debit cards. Blockchain-powered applications like Fummi represent a growing sector that will digitally enfranchise millions of Americans in need of services with a digital wallet. The market for virtual wallets has grown as vendors — like ApplePay and others — increasingly accept Bitcoin and other virtual currencies. It's important to note, however, that blockchain is not the same as Bitcoin, which is a type of digital currency that saw a meteoric rise in 2017. The two concepts are related, as blockchain is the platform that makes Bitcoin possible. Already, numerous companies as mainstream as Microsoft and Dish Network are accepting Bitcoin for payment. As the world of virtual currencies matures, it will become increasingly easy to exchange one currency for another and access the wider market.

Transportation on the Blockchain

As self-driving vehicles continue to be tested in cities nationwide, they bring with them large implications for the states they navigate, like Arizona, Nevada, Pennsylvania and others. Fully self-driving cars will have the capability of connecting with others on the road for a seamless experience. For more information about the impact of autonomous vehicles on cities, check out our resource, *Autonomous*

Vehicles: A Policy Preparation Guide. Every autonomous vehicle will have a unique operational number linked to a blockchain-enabled virtual wallet pre-loaded with digital currency in the same way one might prepay a transit card. As computing power increases in cars, the potential benefits range from real-time traffic negotiations between vehicles to allow for better traffic flow to pricing structures that would allow one vehicle to pay a premium to go faster than those around it.

Imagine variable tolling at the micro-level of an individual car. If you are in a rush, your car could negotiate with vehicles around you for right-of-way at a preset premium. Drivers that are in less of a hurry would move out of the way automatically and be compensated for increasing their travel time. Blockchain would allow for car owners to negotiate



Blockchain in Cities: Restoring Trust and Transparency in Digital Transactions

rates and exchange money in real-time with no middle man or transaction costs.

Additionally, paying for traditional tolls or even fuel — whether gas or electric — could be just as seamless. Once at your destination, the vehicle parks at a metered space or continues in a shared mode where it is continually carrying other passengers throughout the day with payments sent and received through blockchain. If the owner chooses not to share their vehicle, the meter opens a transaction with your digital wallet, and is paid — a fraction of a penny for every second the car is parked in that spot — in real time.

It must be noted, however, that it will be incumbent on policymakers to alleviate potential inequities that could arise due to these types of real-time electronic transactions. At the same time that someone has their car set to automatically negotiating better, more

seamless travel by paying a higher rate, lower income drivers will be at an immediate disadvantage, because they cannot afford to pay higher rates. This type of dystopic outcome could be further exacerbated by others that seek to drive around clogging the system to be paid to 'get out of the way.' Suffice it to say, the techno-optimist viewpoint may prevail, and we could all find ourselves in optimal situations with mobility working seamlessly as we glide through traffic. Again, the policy environment will be critical to set the rules of the road.

Once self-driving vehicles become widespread, cities may experience a decrease in parking revenue as the cars multi-task with a variety of passengers instead of sitting idle in a parking space. In this case, when self-driving cars are parked, cities will receive metered parking revenue in real-time, and will no longer have to pay for enforcement. Residents will no longer have to worry about fines



Photo credit: Metering.com, 2018

or feeding the meter. This shift presents a challenge for many cities. Pittsburgh, for example, derives 15 percent of its city budget from parking fines.¹¹ That would be a significant loss. Further, if more people turn to the ease of ride sharing, cities stand to lose public transit revenue.¹² Blockchain may provide a way for cities to tax ride sharing transactions and make up the difference.

These examples show how blockchain allows for economies, like that of parking revenue in cities, to be safe, transparent and instantaneous, and to have little or no transaction costs.

Alternative Energy on the Blockchain

Blockchain also has the potential to positively impact a city's energy sector. In 2015, renewable energy made up 64 percent of all new electricity generating capacities constructed in the United States.¹³ As the nation diversifies its energy sector, several grid innovations like microgrids, energy storage technology and smart meters could improve efficiency and democratize the platform.¹⁴

For example, the Brooklyn Microgrid (BMG) is a transactive grid project designed by LO₃ Energy and the Siemens Digital Grid as a peer-to-peer energy trading system. The project aspires to bypass electricity companies and ultimately lead to a national microgrid system.¹⁵ A microgrid is a localized energy system that can operate independently of the traditional grid. Blockchain technology allows for the transference of electricity credits to be executed through a secure, low-cost and public digital ledger/database that all users can

reference.¹⁶ For instance, residents can finance solar installations by selling excess solar energy to nearby neighbors. In the case of a shortage, residents use the traditional power grid as a backup. This sustainable shift is cost effective, self-financed, and avoids the waste associated with centrally-produced and distributed power which causes state and local capital expenditures.

Beyond city operations, blockchain promises to innovate the way residents start businesses, structure investments and account for wealth creation and exchange. Cities stand to benefit not just from increased efficiencies with lower costs, but also from greater economic integration and participation.

Opportunities for Governance

In May 2017, the Department of Homeland Security granted awards of \$2.25 million each in research contracts to three blockchain startups as part of its Small Business Innovation Research program.¹⁷



The awards are promising steps towards meaningful collaborations between blockchain innovators and government.

While the United States government has not yet publicly promoted or experimented with blockchain, other nations have used the secure and unchangeable platform technology to pursue new forms and applications of governance. As more of the administrative aspects of individuals' lives move into the digital world, it makes sense for government to experiment in this realm while remaining vigilant in addressing the security and privacy concerns that arise in any conversation surrounding digitalization of public infrastructure and processes. The following are discussions of areas in which this is particularly important for city and local governments.

Elections

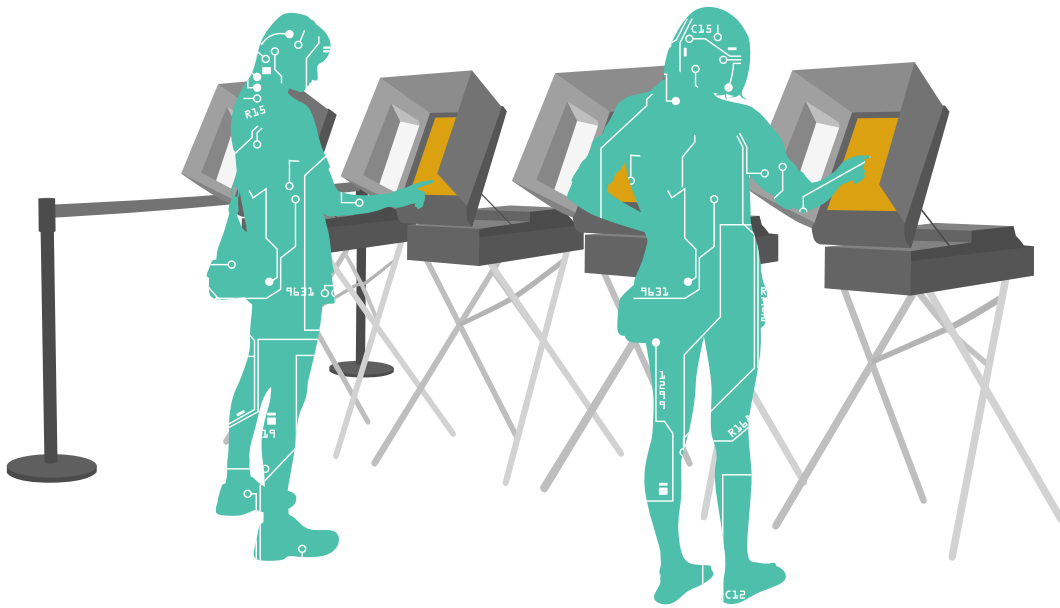
It is no secret that the United States has fallen behind most other developed countries when it comes to voter turnout. In fact, the Pew Research Center found that, in 2016, only 55.7 percent of voting-age Americans cast a vote in 2016.¹⁸ Blockchain can enable secure, real-time representation with decentralized voting. It can also promote increased

engagement in decisions related to city government, such as online participation in a referendum or city ordinance change. Organizations like Follow My Vote and Democracy Earth have developed ways in which individuals can vote in elections or delegate their votes in real-time.^{19 20}

Follow My Vote aims to increase voter turnout, as well as improve the security and accountability of elections. The organization promotes blockchain as a means to organize voting in any election securely from individuals' cellphones or computers, or connected voting stations. In this scenario, individuals would register much like they do in today's elections, but would be given their own secure accounts and identification numbers from which to cast their ballots. Ballots, in turn, would be anonymously counted in real-time. Imagine a secure election with high voter turnout and results available the minute after "polls" close.

Digital Government

The list of states introducing and passing blockchain related legislation is growing. Most of these bills commission the study of blockchain while others seek to attract companies and startups with blockchain-based business models. In 2017, Delaware passed a



Blockchain can enable secure, real-time representation with decentralized voting.

measure that allows corporations in that state to “use [distributed ledgers or a blockchain] for the creation and maintenance of corporate records.”²¹ Former Delaware Governor Jack Markell introduced the Delaware Blockchain Initiative in May 2016, committing the state to progressively deploying the technology.²² The initial phase involved using blockchain as the infrastructure for the state’s public archives. Smart records can now automatically comply with laws of retention and destruction, as well as being more searchable and accessible.

Delaware has since been followed by Illinois. The state launched its blockchain initiative as a way to build a collaborative space to inform an array of state departments about the technology, as well as to solicit input and collaboration from the private sector.²³ Since the launch

of blockchain initiatives in Delaware and Illinois, other states including Nevada, Arizona, Vermont and Maine have all introduced or are considering legislation aimed at legitimizing the electronic signatures made on blockchain as an enforceable transfer of ownership.²⁴

For a current map of blockchain related legislation, visit the Center for City Solutions at: NLC.org/blockchain

The First e-Nation

Local governments in the United States are leading the charge towards blockchain-based innovation, but other nations are also fully embracing these trends. For instance, since its highest court ruled that the internet was a basic right in 2000, Estonia has become the world leader in digitizing government. The country has moved to what it calls

“e-Estonia,” where everything from voting and business registration to cabinet meetings can be conducted online. In order to do this, the government issues every Estonian an e-identification card which carries its own 2048-bit key encryption. Nearly 95 percent of the population uses their cards for everything from filing taxes and voting to picking up prescriptions and paying for public transit.

The gains in efficiency that Estonia has experienced are significant. For example, after moving title registration to its e-Land Register (a unique website that contains information on ownership related to real estate and land), the process time for land transactions went from three months to eight days. Their e-Justice system allows anyone to file a claim electronically and receive a hearing within the next hour. Evidence can be entered electronically, questions posed and legal representatives involved, all digitally. And if the case is simple enough, no court visit is necessary. Businesses can now register themselves and file annual reports entirely online, reducing the time needed to register a business from 5 days to 18 minutes. This type of administrative streamlining holds enormous potential for cities and the ability for new businesses and start-ups to thrive in local economies.



Tallinn, Estonia: The capital of the first "e-Nation."

Challenges and Barriers

The image features a solid blue background with a subtle white grid pattern. Scattered across the grid are numerous wireframe cubes, some in white and some in a light yellow color. The cubes are arranged in various orientations and some are stacked, creating a three-dimensional effect. The overall aesthetic is clean, modern, and technical.

Blockchain-driven innovation and disruption provides great opportunity for our country, our states and our cities, but many of the best and most meaningful applications for this technology still lie ahead. The pace of innovation is fast.



Perhaps it's even faster than you imagine. At its broadest, blockchain is sparking a new computing paradigm that offers decentralization, coordination and collaboration in a secure and autonomous way. If successful, it will revolutionize diverse sectors of our economy and bring efficiencies of scale that previously required large, centralized operators in order to have an impact. This technology can help to remake our economy, our society and our public institutions, but it is still new and experimental. Here, we discuss some specific challenges reflected today in other countries' cities.

Sustainability and Technical Challenges

Cities powered by blockchain can be more resilient and secure, but challenges and barriers to adoption of the technology persist. This is a lesson well learned by the world's first digital nation, Estonia. In April 2007, a wave of cyberattacks likely originating from Russia targeted the country's digital infrastructure. Since this attack, Estonia has become Europe's hub for cybersecurity companies as well as home to NATO's Cooperative Cyber Defense Centre of Excellence.²⁵ Building on momentum in this space, in Dubai, local government has created a special office charged with transforming Dubai into a

smart city. It's called Smart Dubai Office and was launched as the first city-wide blockchain strategy in October 2016 with the aim of becoming the first blockchain-powered city in the world by 2020.²⁶

While the innovation charges ahead, it has experienced some technical issues. For instance, Bitcoin, the popular blockchain application, has struggled with issues related to storage and sustainability. One estimate shows that a single bitcoin transaction uses three thousand times more power than a credit card payment.

Regulatory Challenges

The validity of cryptocurrencies (digital assets) as well as blockchain applications are still uncharted territory. As mentioned earlier, a number of U.S. states have taken steps to validate the electronic signatures within blockchains as enforceable under contract law. While cryptocurrency exchanges began cropping up around the world, the Securities and Exchange Commission rejected two Bitcoin ETF proposals in 2017 while the Internal Revenue Service issued a John Doe Summons to Coinbase, Inc., a digital currency exchange, for user and transaction history.²⁷ Both actions centered on concerns around the anonymity of users

This technology can help to remake our economy, our society and our public institutions, but it is still new and experimental.

and possibilities for tax evasion and money laundering.

New York State Department of Financial Services (DFS) Superintendent Ben Lawsky became the first leader to address this regulatory challenge, requiring and issuing the first BitLicense. The New York DFS now requires anyone who stores, holds, transmits, buys or sells cryptocurrencies for commercial purposes to obtain a BitLicense, which registers them as a commercial agent allowed to hold and use cryptocurrencies for this purpose. The same requirement applies for anyone who performs or exchanges services for commercial purposes, and controls, administers or issues virtual currency.²⁸ Many in the industry decried this regulation as a step towards protecting incumbent businesses and threatening innovation. Illinois has

since taken a light-touch regulatory approach in the form of iterative forums and issuing nonbinding guidance.

Regulatory bodies' slow pace in adapting to blockchain-powered innovation has delayed the advancement of projects such as the Brooklyn Microgrid which we explained earlier in this report.²⁹ Although the project operates on an energy credit system, it has not yet been recognized as a utility that can buy and sell power. This means it could potentially lag behind other innovations. Government can engage with and encourage blockchain innovators, much like the Central Banks of Australia and Canada have, through in-depth studies, beta testing and grant awards, and creating and encouraging dialogue between regulators and the industry. Launching initiatives that coordinate between public agencies

and the innovator community has been successful in informing public administrations about the unique concerns and possibilities of blockchain technology. Isolating experimental missteps and moving partnerships into limited trials has become an ideal way to begin slow and gradual implementation.

Financial Speculation

While this is not an issue for private blockchain networks or blockchain applications beyond financial transactions, the explosive market capitalization and valuation of Bitcoin and other cryptocurrencies may not be sustainable. Recently, the market capitalization for cryptocurrencies surged exponentially while at the same time concerns have grown that the technological hype is driving a bubble similar to the dot-com boom of the 1990s. A proliferation of alternative

cryptocurrencies that are exchangeable and tied to Ethereum (a common open source coin platform for startups issuing their own coins to build from), known as altcoins, has led to an increasing demand for the cryptocurrency.

Ethereum has swelled dramatically. As many new startups increased demand for Ethereum, the price of the cryptocurrency skyrocketed, leading holders of the currency to invest in more startups with smaller amounts of their total wealth and attracting less well-informed investors to the market. Total market capitalization of cryptocurrencies, including Bitcoin, stood at over \$350 billion in March of 2018. This could be a sign that the cryptocurrency ecosystem is maturing. On the other hand, with recent volatility sending cryptocurrencies soaring to more than \$800 billion in early 2018, this market capitalization could also be the marker of an unsustainable build in demand.

Key Takeaways for City Leaders



The purpose of this whitepaper is to raise an important topic and inspire conversation about blockchain technology, not to promote immediate and wholesale acceptance of the technology by city leaders. Blockchain is new and exciting. It encompasses an incredible ecosystem of innovators and entrepreneurs that have come together over the past few years. It is a platform technology – the economic layer to the internet. It also has astonishing implications for our economy and social organization.

Cities like Dubai and states such as Delaware and Illinois have already launched initiatives to encourage



- 1** Use blockchain to expand digital inclusion initiatives and help support the un- and under-banked.
- 2** Explore options for using blockchain in governance, procurement processes and business licensing.
- 3** Consider blockchain to increase civic engagement and offer additional pathways for voting.
- 4** Investigate how blockchain can help strengthen local alternative energy initiatives.
- 5** Prepare for the utilization of blockchain for digital transportation infrastructure needs as autonomous vehicles are more broadly deployed in cities.

and adopt blockchain innovation in a cautious and iterative process. This style of approach is the right one.

Ultimately, cities are strategically placed to act as conveners, and can bring regulators, multiple levels of government, innovators and the private sector together to work to create the conditions to explore and adopt this technology in a constructive and informed manner.

As a reader, this may be the first time you have examined the technology and its implications, but it won't be the last. Here are seven key ways that cities can explore blockchain now:

- 6** While the benefits could be manifold, be cognizant of the potential for negative externalities that will need to be addressed and make sure that cities give themselves time to absorb each impact of introducing this technology.
- 7** Pay attention to what other cities have experienced and learned when it comes to blockchain. And above all, keep an open mind and be open to change. This new technology might just bring some unexpected yet very welcome benefits to your city and its residents.

Endnotes

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