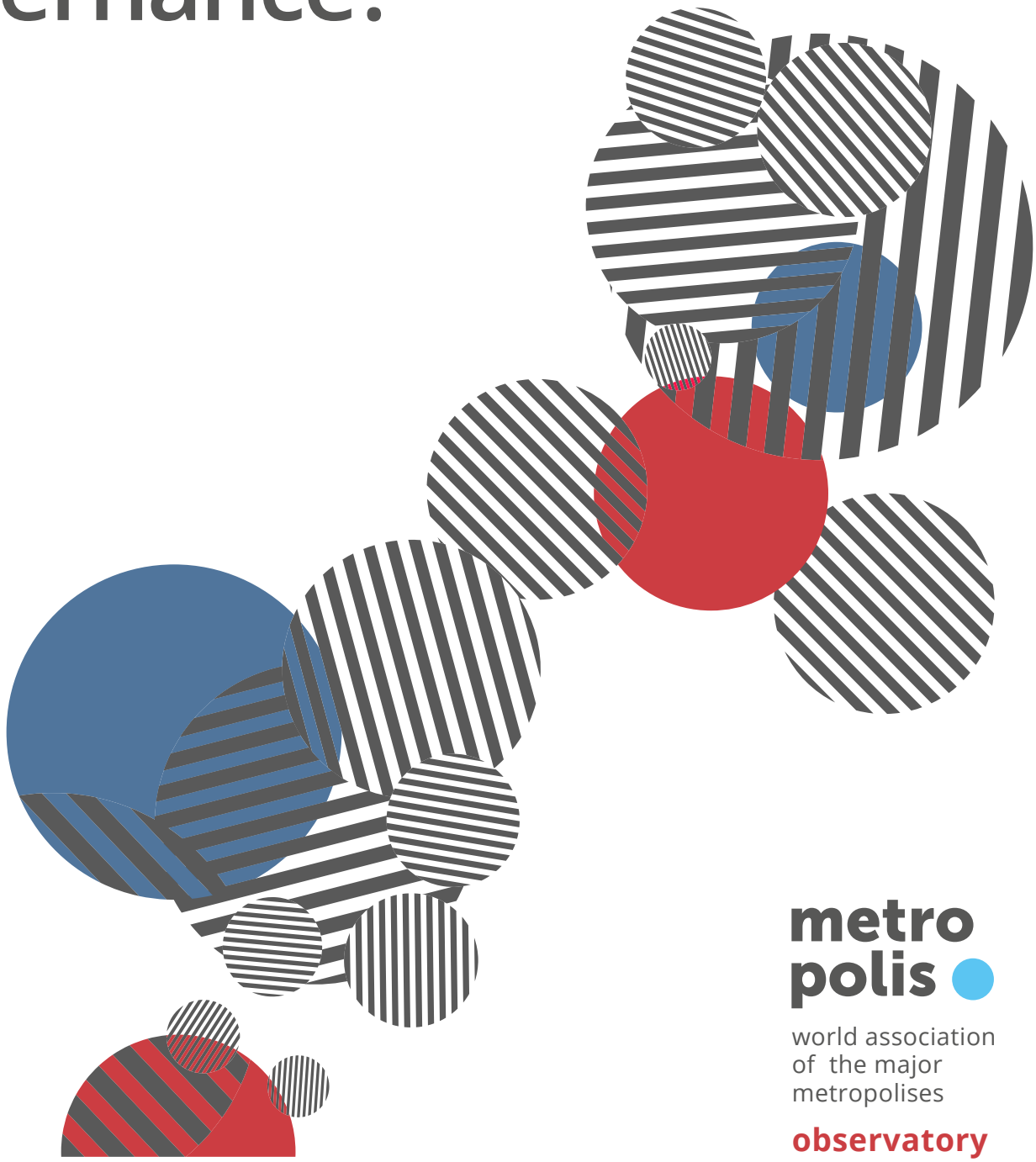
Metropolis Observatory
Alfonso Govela

05

ISSUE PAPER

Blockchain, a tool for metropolitan governance?



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Introduction

Blockchain is the latest buzzword. It is such a hot topic that it is even being talked about in relation to urban areas. Blockchain technology presents itself as a technological revolution, on a similar level to the internet when it first appeared. And like the internet, which originally emerged from the military and industrial sectors and is now found in every sector and across every aspects of people's daily lives, blockchain technology also started out in a specific industry – finance – and its use is quickly spreading to a number of fields, such as energy, telecommunications, and more.

Technology is a resource that can improve people's lives, when it is used as part of a broad and sustainable social approach. Technological innovation is a vehicle to get where we want to go, when we know where that is. But, at the same time, it is a means to explore unknown areas, when we need to discover new solutions to our current problems. In the field of innovation, as in any other area of urban life, reaching the delicate balance between 'means' and 'ends' in the benefit of the common good requires a continuous collective effort.

Some see blockchain as a factor for change in both the economy and society, with the potential to transform industry, services, and social interactions. In the context of the spatial dispersion and social segregation that characterise large metropolises, blockchain has the potential to improve the coordination between the numerous different authorities in any given metropolitan area, contributing towards social and regional cohesion. But will blockchain only bring about technological changes, or will it spark a social revolution?

How can blockchain be used in metropolitan governance and financing? What has already been achieved with this technology? What else can be done? How should the technology be used? What lines of policy could be put in place for urban innovation in our metropolises? In this document, the fifth Issue Paper published by the Metropolis Observatory, we invite Alfonso Govela, an architect and urban planner specialised in digital technology, to answer these questions and help us understand what blockchain is, what it means on a technological, political and social level, what role it plays in transforming society, and whether it can lead to better models of metropolitan governance.

Octavi de la Varga
Metropolis Secretary General

What is blockchain?

Blockchain technology was originally created to solve two of the problems inherent to digital currency. The first is «double spending», a result of how easy it is to reproduce an identical copy of any digital file. This means that in electronic financial transactions, the usual «copy-paste» takes a sinister turn when the copied information is a monetary exchange value, as this encourages fraud and transfers of amounts that do not exist.

The second problem lies in the need for a central authority to validate payments. Legal currency always has a central authority (usually national central banks) to issue currency and guarantee its authenticity. Money transfers are governed by a financial authority that makes sure that the transfer of assets is properly recorded. In such cases, we place our trust in both the issuing authority and the reputation of the intermediary service. When new platforms on the internet result in an exponential increase in the number of transactions, and the risk of interacting with unknown parties, how can we ensure that the intermediary service is efficient while still meeting our need for direct and reliable transactions? How can we make sure the currency is only used once per transaction, and that it is not copied illegally to pay for two or more transactions using the same instrument?

Satoshi Nakamoto, a pseudonym that still remains anonymous, published the answer to these questions, and how to safely transfer funds digitally, in 2008. That solution was blockchain, and its name is a direct description of what it is: a chain of data blocks ordered in a way that is both dependable and immutable. From a broader perspective, blockchain is a Distributed Ledger Technology, or DLT, that allows networks of databases to be developed. In these networks, members of a given community can create, validate, store and share information in a safe and efficient way, at any time and without geographic limitations. These networks operate without a central governing body (or with one if they so choose), and can show the full transaction history (or decide to keep it hidden). However, modifying the details of the transaction history, or some of its records, is practically impossible, which means the information stored there is highly reliable. Every member, or node, of the network shares a decentralised copy of the data stored on it, and has access to the data (regulated or otherwise).

This means blockchain democratises the ability to validate transactions, which was previously restricted to central, normally national, financial systems. This technology therefore encourages new ecosystems to exchange financial and non-financial assets. Blockchain made Bitcoin possible, the first ever encrypted digital currency, or cryptocurrency. Using cryptography, Bitcoin identifies the parties on a network and encrypts the messages sent between them. It then uses consensus to build a confirmed record of their interactions.

This record is then shared between all the members of the community to guarantee it cannot be modified. It therefore documents the ownership and transfer of digital assets with inalterable accuracy. As a digital value, currency regains its potential for sharing information and its use as a social instrument. Blockchain therefore opens up new opportunities for collective coordination, allowing money to regain its original function as a tool for social interaction, and as a mechanism for exchanging value.

It is important to note that although Bitcoin requires blockchain technology to work, blockchain is independent of Bitcoin. Blockchain's potential goes much further than supporting this digital currency, because it can extend to the registration and transfer of ownership of any physical or digital asset. Blockchain allows the exchange of true ownership of a particular asset to be recorded in a digitally immutable form, and direct payments can be carried out between equals without the need for validation from a central authority. This means the technology has led to the creation of new ecosystems for transactions of total value, whether financial or non-financial. The ability to create reliable transaction flows between anonymous parties has turned blockchain into a powerful tool for social coordination.

In an age marked by uncertainty, it is easy to understand the success of a technology that protects data security, encourages mutual trust between parties, creates immutable records, allows data to be transparent and normalised, ready to implement automatic processes or Smart Contracts (also known as dAPPs), encouraging collaboration through clear reward mechanisms.

However, it should also be noted that this new technology is in the explosive phase of scientific discovery and business models. It has not yet reached the stability of developed tools ready for mass sales and repetitive use. Although this situation makes it harder to understand blockchain and come up with strategies to develop it further in the future, it also opens up the possibility of local development, moving towards contextual solutions for the challenges faced by metropolitan governance.

Blockchain is a technology that enables the development of database networks where community stakeholders can create, validate, store and disseminate information securely and efficiently, across geography and time

How can blockchain be used for good metropolitan governance?

Blockchain decentralizes trust in a consensual manner, through peer interactions, and strengthens coordination between authorities and citizens in the territory

Blockchain's fundamentally groundbreaking aspect lies in the way it decentralises consensus and allows unidentified parties on any network to trust each other for interactions and transactions. Both of these issues lie at the heart of any system of governance, including, in this case, the governance of metropolitan areas.

Blockchain's truly transformative nature lies in the decentralised consensus of trust in peer-to-peer interactions, without any need for validation from a central authority. The technology's immediate impact is therefore to strengthen the ability of authorities and citizens in a given region to coordinate effectively. Blockchain's immutable and shared transaction record provides transparency and verifiability, which means its potential will allow us to increase our knowledge about cities in the future and successfully drive forward democratic processes that encourage social inclusion and prosperity.

Blockchain offers the possibility of trust, consensus and knowledge to improve the effectiveness and efficiency of metropolitan governance. Metropolises face significant economic challenges and environmental threats, and their governance is frequently divided between a number of different authorities with limited powers, preventing them from offering a coordinated response to challenges, which in turn makes it more difficult to build social cohesion in the metropolitan area. Blockchain can help create a new institutional structure for metropolitan governance, as long as it is used to organise interactions between the parties involved in public issues, to make decisions, and to draw up guidelines, or the rules of the game, that allow us to achieve the best for society.

Blockchain can help to implement a people-centred agenda, a governance based on transparency, new opportunities to renew the social contract between public institutions and citizens, take on a regional approach to development, encourage new patterns of consumption and production, track a reduction in the consumption of natural resources, and mobilise the funding required to reach the Sustainable Development Goals (SDGs) and the New Urban Agenda (NUA).

There are six lines of action that can help manage the development of this technology on a metropolitan scale, while integrating it in specific areas that can be adapted and applied to different metropolises:

Citizenship and democracy

The right to identity is a human right, and a birth certificate is the official record of our existence. Identification is the source of our rights and responsibilities, and represents the gateway to the services we require in the physical or digital world. The unique identification of citizens using blockchain means they can be registered in an unmodifiable way, with anonymous data protection, while allowing a person-centred agenda to be implemented. They can take part in impregnable voting pro-

cesses, which will increase trust in transparent governance to empower citizens to work together and towards social cohesion, through a solid empirical base.

Blockchain also helps authorities to increase citizen trust in the system through better electoral processes. It guarantees that voting is confidential and unalterable, as well as the transparency of the process. The technology makes it easier to plan elections, register and verify voters, issue and count votes, and share, audit and validate the results.

The unique identification of citizens based on Blockchain allows the anonymous protection of their data and will facilitate the implementation of an agenda focused on people

Property and land use

Blockchain can help benefit one of the foundations of the metropolitan economy: land and property development. It guarantees that property ownership is recorded and lists the transactions, obligations and impositions of the real estate market with their corresponding finances. This allows an ecosystem to develop around property value that includes all the stakeholders involved: the general public, the people or organisations that own the land, related companies in the sector, certifying bodies, property appraisers, tax authorities, and planning or urban administration authorities.

Blockchain shows real estate property rights as digital assets, and keeps records of their registration and certification, any construction or urban development rights, and the collateral used for financing. It also makes it easier to access public knowledge on the origin, transactions and obligations related to a property.

Blockchain also makes it easier to carry out real estate transactions: holding, selling, buying, mortgaging real estate and using other financing instruments; authenticating, certifying, assessing, taxing, planning and managing their value, keeping track of use, and transferring ownership.

Records relating to land, land tenure and the official land registry will make it possible to take a location-based approach to development and mobilise the real estate market to ensure the taxation and funding needed for sustainable urban planning.

Infrastructure and services

There is clear potential for creating markets for digital asset transactions related to existing urban infrastructures, and this technology is just starting to be applied to urban metropolitan services. Blockchain will allow for new ecosystems of interactions between citizens, service providers and metropolitan governments to be explored. It offers the chance to build platforms that improve our material quality of life, opening up business opportunities and providing work for the inhabitants of the metropolis.

In particular, new energy markets are already in operation on the existing infrastructure. The use of smart meters connected to the internet, used

Blockchain will allow the automation of the simplest and most repetitive functions of public administration and the generation of smart contracts which will benefit citizens

as nodes for electricity consumption and production in buildings, has made it possible to quantify the cost, co-generation and payments corresponding to individual electricity use from the electric grid, in both directions. As part of this process, blockchain makes it possible to automate the trade of surplus energy in any node. It tracks each unit of electricity from its point of generation to its point of consumption, via the local electric grid, and matches each energy transaction with its equivalent financial transaction, simplifying the process and making it more efficient.

Ecosystems of values

The ability to digitally register values and trace their origins, whether natural or cultural, makes it possible to guide new processes for producing and consuming goods. Blockchain is an "Internet of Value" and, if we extend its potential beyond its financial value, we can encourage the transfer of non-financial values to spark a productive dialogue that incorporates existential differences and that responds to the needs of communities with a range of specific interests, whatever they may be.

If we want new production and consumption models for metropolises, we first need to know which values we need to encourage and head towards. We already know the traditional financial operation for existing models. To improve on this, we need to pay attention to exchanges of non-financial values in our communities.

The blockchain transaction history can keep a record of any values that are shown to be important to a community. If this involves the consumption of natural goods, then the transaction history will show the origins of organic agriculture or the product's carbon footprint. If it involves the consumption of cultural goods, then the transaction history will show the exchange of content.

If the objective is to reinforce a specific behaviour that promotes a particular community interest, then the interactions will emphasise the values related to gender, belief, halal or kosher foods, Sharia law, political credibility, ethical behaviour, or any other value system defined by each group.

Government and public tenders

An immutable record of government actions will encourage transparency, while the ability to check the record will lead to accountability. Both aspects will strengthen new models of governance and local autonomy, which will improve the way metropolises operate through a series of integrated urban instruments. With blockchain, re-structuring administrative systems will allow the simplest and most repetitive functions carried out by public authorities to be automated, so that citizens can be supported by Smart Contracts, or dAPPs. Over time, and with experience being used in governance, Smart Contracts could start to build automatic, decentralised hybrid systems (both human and digital).

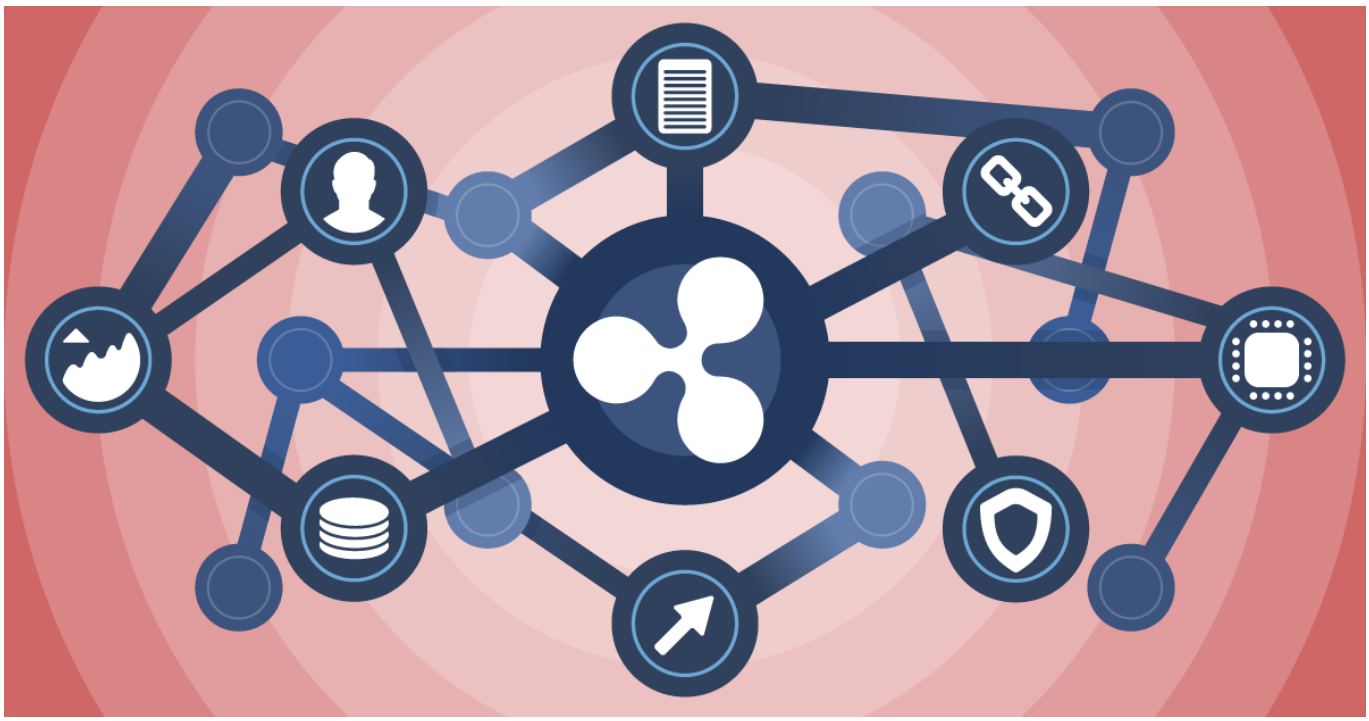
Alternative currencies

Alongside language and cities, money is one of the oldest tools for social interaction. Alternative currencies have always existed in parallel to legal currencies, and there are currently around 4,000. These currencies were started to solve crucial problems at a difficult time in the history of local or regional communities, and they make it possible to strengthen social cohesion by providing the flexibility needed for certain economic systems to change and evolve. This means they are a means to institutionalise the community itself, and they frequently become the catalyst for new ways of development.

Cryptocurrencies are digital assets that have no intrinsic value, and are not issued by any sovereign authority. They derive their value from the expectation that they can be used as a means of payment, or eventually exchanged for legal currency. They are transferred and validated by blockchain.

New financial instruments can channel the vast amounts of money that are currently used for financial speculation. Blockchain therefore provides a significant opportunity to create new markets and alternative currencies. The only limit is our creativity in terms of how many and which currencies will be used to mobilise the indispensable funding required for our cities and regions to comply with the SDGs and the NAU.

> An example of an alternative payment system is "Ripple", which relies on a peer-to-peer social network to develop a new credit system.



Source: descryptive.com

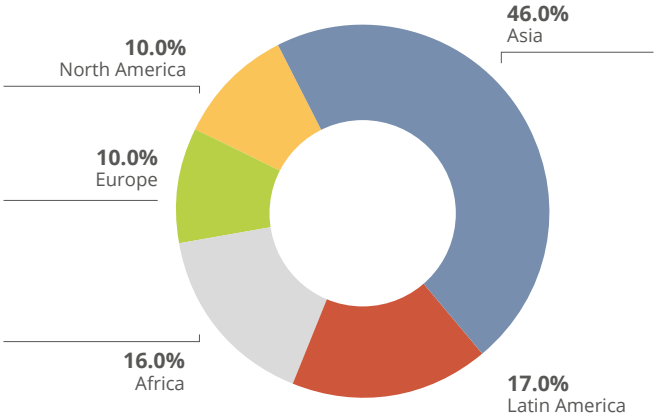
Budding projects in our metropolises

Blockchain has already started to be used around the world in a number of different ways, driven by a broad range of stakeholders in the government, business world and civil society. A study carried out specially for this Issue Paper, in June 2018, shows the footprint on Google for initiatives in regions with Metropolis members. A total of 254 projects in a range of different fields are being implemented in 69 of the metropolises that are members of the association, to varying levels of progress.

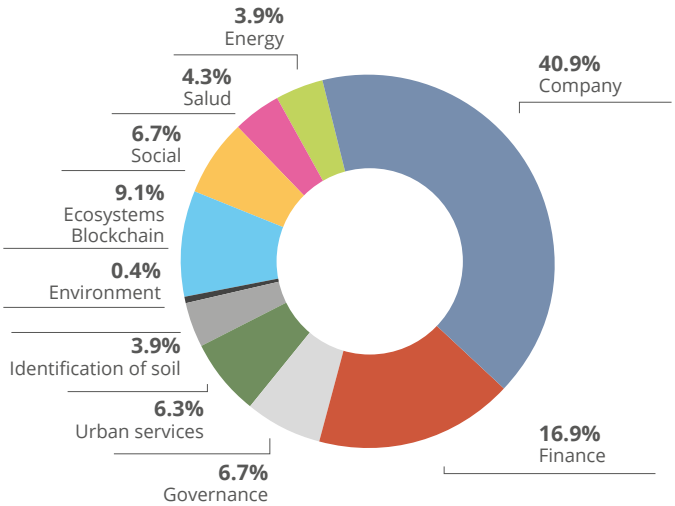
Projects in the business and financial sectors make up more than half of the examples found, with certain other sectors lagging behind, such as social applications, governance, urban services, the health sector, energy sector, citizen identification, land registration and, behind all the others, environmental representativeness. However, the proportion of projects that have advanced significantly reflects the importance of striking a balance between the three defining characteristics of this technology: government support, market forces and the urgency of social problems.

The majority (58%) of the projects are in their preliminary phase, and have barely developed their own specific platforms for particular cases under the six lines of action identified in the previous section. On the other hand, 28% of the projects have advanced to an intermediate level; they have built platforms, but have yet to scale their user ecosystems. Only 14% of the projects have advanced to a high level, with strong ecosystems and multiple participants involved. Nonetheless, these initiatives open up specific possibilities for action, in which there are practical examples that show the most important paths to follow.

The geographical distribution of the 69 Metropolis members where blockchain initiatives are being carried out

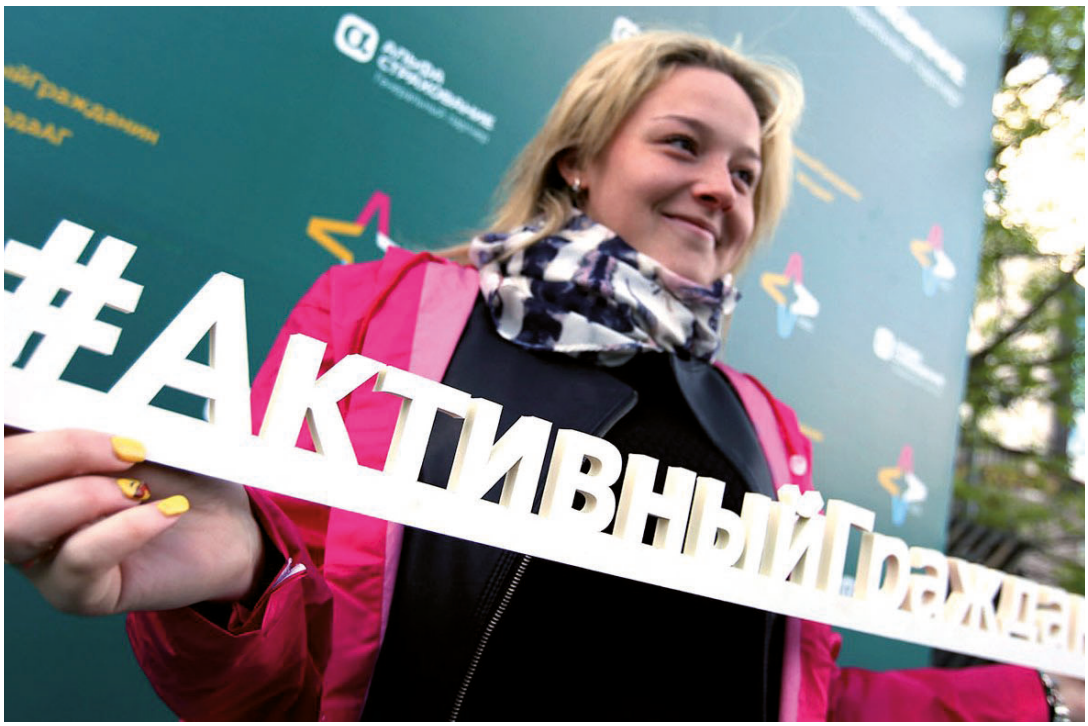


The sectors in which the 254 initiatives run in regions with Metropolis members are based



Source: research by the author

> In **Moscow**, a blockchain-based platform allows citizens to make decisions on how urban spaces can be improved.



Source: Moscow Government

Citizenship and democracy

The DECODE project, which is funded by the European Union and carried out by a consortium by 16 entities, including **Barcelona City Council**, was launched in 2017 to return the ownership of personal data to citizens (for data they generate themselves), while strengthening their control over how their data is shared. The project's goal is to integrate this individual information with the data collected by the Internet of Things (IoT) and sensors, to support a digital economy built on data. During its pilot phase, the project was launched in the Catalan capital and also in the city of Amsterdam.

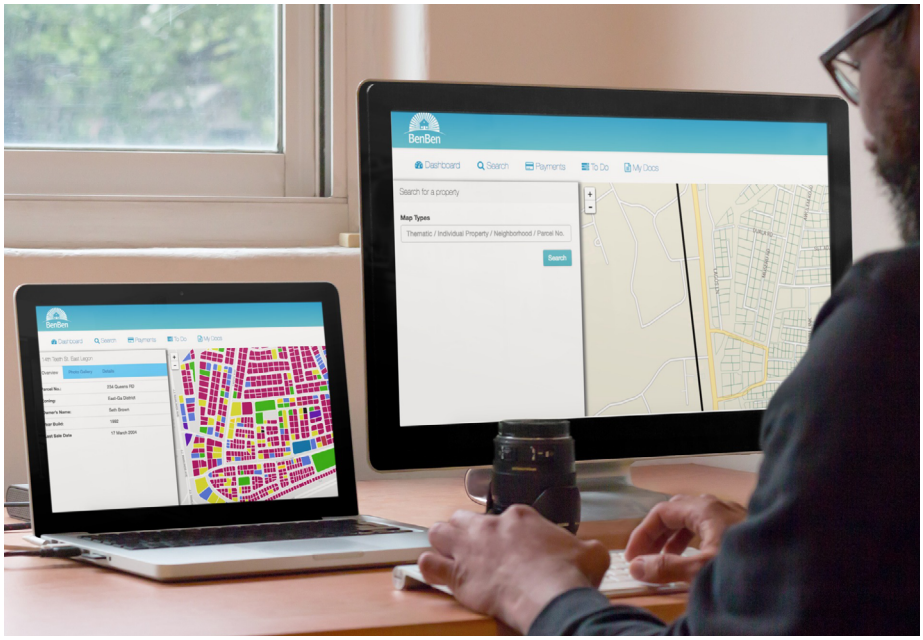
In the field of improving the electoral process, the **Moscow Government** launched the project Active Citizen in 2014. This application allows citizens to vote electronically in referendums on non-political issues: 2,700 surveys have been conducted since then, and 2 million of the city's 11 million residents have taken part, with 88 million opinions registered. The aim of the application, which has several similar counterparts around the world, was able to encourage citizen participation. In 2017 the platform was moved to blockchain technology in order to ensure its data could not be modified, to increase security and improve citizen confidence.

Property and land use

In June 2016, the Ghana Lands Commission asked BenBen to produce a national information system for land and a property tax platform, which was first implemented in the metropolis of **Accra**. This is a prominent example of youth entrepreneurship, as it was founded in 2014 in a blockchain student association at the University of Michigan. It has received acknowledgements from the United Nations Sustainable Development Solutions Network, and meets SDGs 9, 10, 11, 15 and 16. The system takes advantage of blockchain to provide local authorities, financial institutions, real estate agents and the public in general with information on real estate, as well as making it easier to pay taxes, annual income tax and mining royalties digitally, among other uses.

Similarly, in **Dubai**, the government land department is responsible for optimising the property market. The United Arab Emirates government has launched the Blockchain Strategy 2021, which aims for 50% of all government transactions to be carried out over blockchain by 2021 using a unique citizen identification number, with secure data protection and immutable, trackable records. This knowledge platform also opens up an ecosystem of business opportunities in the real estate, fin-tech, banking, health, transport, urban planning, energy, e-commerce and tourism sectors.

> The national system of land use in Ghana, which was initially implemented in the city of **Accra**.



Source: BenBen

Source: 8btc

> The launch event for the **Guangzhou** Blockchain Industry Association, on 28 July 2017-

Infrastructure and services

Bangalore is the metropolis where Somish was founded, a start-up that developed the generic GovBlocks platform as a protocol for decentralised governance that empowers user networks with incentives that help align their particular interests. Its peer-to-peer (or P2P) project for the surplus energy trade market allows peer-to-peer transactions to be made quickly and efficiently, using a model that the University of Oxford calls a «federated generating plant».

In **Guangzhou**, the Guangzhou Blockchain Industry Association, created in 2017 by the Huangpu District government, encourages cooperation between local start-up companies, as well as a strategic alliance with the telecommunications giant Alibaba Health Information Technology. The project's aim is to discover better healthcare solutions through a Linux Foundation platform that supports production supply chains.

Hangzhou, on the other hand, has created the Blockchain Industrial Park, which is backed by a fund worth $1,600 USD million, the largest governmental fund in the world for the blockchain sector.

Finally, in **Tunisia**, the United Nations World Food Programme uses blockchain technology to safely track and deliver school lunches to Tunisian children.

Source: Centar Za Afirmaciju i Razvoj

> In **Wuhan**, an algorithm provides financial motivation for ethical and honest behaviour through crypto tokens.

Ecosystem of values

In **Berlin**, there are several commercial platforms involved in: building blockchain applications, programming Smart Contracts and connecting them to real-world data, applying DLT to pre-existing databases, modular toolboxes, creating blockchain internet networks that connect parallel networks, citizen ownership of data, facilitating payments with cryptocurrencies, and producing market forecasts. Also based in Berlin, the JOLOCOM project – a prototype for which was launched in February 2018 with support from Deutsche Telekom – promotes sovereignty over self-identity to manage personal data, verify identities when accessing different digital services, and control the information you want to share. These factors are all indispensable requirements to meet the potential of an economy based on Smart Contracts.

In the metropolitan area of **Buenos Aires**, we find the Waba project. Waba is an application that encourages the social, civic and economic integration of the inhabitants of irregular settlements through communities that self-manage the governance of their own alternative currencies in their local markets.

In **Wuhan** on the other hand, the Wuhan Phoenix Chain Technology has created a consensus algorithm that offers financial motivation for ethical and honest behaviour through monetary awards. Users are paid to create «value» in the community network, where «value» is understood as ethical activities and financial transactions that include buying and selling high-quality goods and services, green activities and donations to charities.

In **Montreal**, large-scale commercial platforms are being developed for financial assessment and international trade, in addition to a platform dedicated to balancing the supply and demand for artificial intelligence.

Toronto is another vibrant blockchain ecosystem in which a gender equality platform stands out in particular, promoting education and offering mentoring to women.

Government and public tenders

With the exception of Dubai, which has integrating administrative processes through the city's Smart City office and the Future Foundation, there are still no examples of Metropolitan governments that are entirely based on blockchain. Despite this, there are some examples of improving processes and actions in the local public sector, especially in Asian metropolises

A Smart Contract was one of the tools created by the Pan-Impact Korea initiative to record and evaluate the promises made by newly-elected officials in the Metropolitan Government of Seoul, the Metropolitan City of Busan and the Province of Gyeonggi. To assess the result of their electoral promises, the initiative produced 50 million tokens called «Cred», one for every inhabitant of the country. Depending on the results of the citizen vote, the tokens, which have no economic value but are instead linked to credibility, are «burned». The number of remaining tokens in circulation represents the «credibility capital» of each elected official.

Another such example can be found in Beijing, where the 13th Five-Year Plan acknowledged the potential of DLT for the first time, the Chinese Ministry of Industry and Information Technology set up the National Committee for the Standardisation of blockchain and DLT, and Startup Grind, together with international cooperation, helped build an ecosystem of entrepreneurs.

In addition, the Shanghai Municipal Development Agency, the Reform Research Institute, Wanxiang Blockchain Lab, Ant Financial, Webank and Micro Focus Bank have come together to create the SBIDRA, the Shanghai Blockchain Industry Development Research Alliance, to promote a standard use of technology between companies.

Asian metropolises are leading pioneering experiences that relate Blockchain to the improvement of processes in public administration, such as the citizen evaluation of public officials

Alternative currencies

Over one thousand cryptocurrencies were launched during 2017, but a good number of them will not outlive the stronger regulations being put in place. Some examples of cryptocurrencies that should survive are the Swiss WIR, the Brazilian Palmas, the S-Coin of Seoul, Waba tokens in Buenos Aires, and the City Coin created by DigitalCivix and the Centre for Citizenship, Enterprise and Governance in the United Kingdom. WIR is an independent Swiss currency that complements the Swiss Franc, created in 1934 in the face of cash shortages and global financial instability. Eighty years later, it still continues via the WIR Bank, which has 62,000 participating members. The "Palmas" is a successful alternative currency that stimulated the economy and local development for irregular settlements in Fortaleza, Brazil. City Coin is a cryptocurrency for urban values, backed up by data and geo-located in the territory. It incorporates communal resources in circular economies and is a unit of measurement for how urban systems are used in city life.

> The alternative currency "Palmas", used in the city of Fortaleza, Brazil.

Source: Banco Palmas

Recommendations

Blockchain makes it easier to manage and institutionalise new metropolitan governance systems with innovative democratic processes for transparency, monitoring, evaluation, automated transactions, knowledge creation, policy design, and promoting new markets for production and consumption.

Its contents are validated by consensus, which provides greater reliability. The fact that its shared records are immutable supports transparency. Transaction history records make monitoring easier. The ability to trace transaction chains shows the accountability of each party. Its reliable and complete set of data for each community of users allows assessments to be made that create knowledge. This knowledge can be used both to support policy design and to encourage specific business ventures. Smart Contracts allow for automatic procedures for repeat transactions, or transactions with a certain level of importance. Its ability to build decentralised ecosystems for value exchange opens up the unique opportunity to create cities

and metropolises from new democratic perspectives, making citizens the protagonists once again.

Blockchain's force for change is the equivalent to that of computers when they were first invented, and which are now used across all social interactions in the broadest sense. Blockchain is based on connectivity, but it goes beyond mere connections. It allows us to extend programmable computing capacity – which means using pre-established rules to obtain results from a set of initial variables – to transfer any kind of values in any of our interactions.

This allows blockchain to institutionalise metropolitan governance as a powerful tool for social coordination. Its real impact lies in helping us build a better and more generous social approach that is both far-reaching and sustainable.

The key steps that have already been taken to apply blockchain to metropolitan governance suggest some guidelines that could be followed by the authorities in metropolitan spaces:

- Creating a basic digital infrastructure by expanding citizen records based on blockchain.
- Structuring technological and scientific development with strict intellectual property protection, a precise geographic location in certain areas, and financial backing with strong private and public investment funds.
- Proceeding to gradually incorporate citizen procedures and public services, step-by-step, through e-government processes that gradually build comprehensive and integrated platforms.
- Integrating the public, private, academic and research sectors.
- Promoting the ecosystems of innovation and entrepreneurship in civil society.
- Building software platforms with multiple functional layers, capable of being created gradually and evolving over time with interchangeable modular components.
- Seeing citizenship and democracy as nodes in the network of metropolitan interactions.
- Considering infrastructure and urban services as built-in intercommunication channels, and the land as the territory in which these exchanges are made.
- Seeing an ecosystem of shared values as the cultural substrate of all social exchanges.
- Anchoring governance as a regulator for operating rules; and seeing finance as one of the main resources to instrument them.

How and in what order these recommendations are implemented, while following the lines of action suggested above, will depend on the needs and conditions, and stakeholders in each metropolitan area. Blockchain, at its very core, is ultimate governance.

Bibliography

Bank for International Settlements (2015). Digital Currencies. *Committee on Payments and Market Infrastructures*. Consultada 2018-05-15 https://www.bis.org/cpmi/publ/d137.pdf

Boucher, P., Nascimento, S., Kritikos Mihalis, 2017. *How Blockchain Technology Could Change our Lives*. In Depth Analysis. EPRS, European Parliamentary Research Service. STOA, Science and Technology Options Assessment. Scientific Foresight Unit. Consultado 2018-04-10.

Chalaux, A., Grau, M., 2000. *Ensayo sobre Moneda, Mercado y Sociedad*. Centre d'estudis Joan Bardina. Barcelona.

Davison, S., De Filippi, P.,Potts, J., 2016. *Economics of Blockchain*. Disponible en SSRN: https://ssrn.com/abstract=2744751 or http://dx.doi.org/10.2139/ssrn.2744751

Guangzhou Blockchain Industry Association (2017), http://news.8btc.com/guangzhou-works-with-alibaba-health-and-ibm-to-promote-the-Blockchain-technology

Govela, A. (2018). *City Coins, Tokens of City Life*. SVIR, Social Values and Intangibles Review. May 2018. CCEG, Center for Citizenship, Enterprise and Governance. Northampton, UK

HKMA, Hong Kong Monetary Authority. *White paper on Distributed Ledger Technology*. Consultado 2018-05-15 http://www.hkma.gov.hk/media/eng/doc/key-functions/finanical-infrastructure/Whitepaper_On_Distributed_Ledger_Technology.pdf

Kennedy, M., Lietaer, B., Rogers, J., 1988. *The Promise of Regional Currencies*. Triarchy Press, Devon, UK

Moscow City Government (2018) "Active Citizen: the best votes of 2017". Consultado 2018-0709 https://www.mos.ru/en/news/item/34873073/

Nakamoto, S., 2008. Bitcoin: *A Peer-to-Peer Electronic Cash System*. Bitcoin. Consultado 2018-04-10, https://bitcoin.org/bitcoin.pdf

Sustainable Development Solutions Network - Youth (2017). *Youth Solutions Report - 1st edition*. New York: Sustainable Development Solutions Network - Youth. Pag. 41

UCLG (2016). *GOLD IV 2016. Cuarto Informe Mundial sobre la Descentralización y la Democracia Local. CO-CREANDO EL FUTURO URBANO. La Agenda de las Metrópolis, las Ciudades y los Territorios*. UCLG, United Cities and Local Governments, Barcelona, 2017.

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