The city as a license: Design, rights and civics in a blockchain society

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This article is a part of special theme on City as a License. To see a full list of all articles in this special theme, please click here: https://journals.sagepub.com/page/bds/collections/thecityasalicense

Introduction

In the past decade, the term "Smart City" has become tightly connected with tech-centric visions for urban environments. As part of these imagined futures, proponents argue that datafication, algorithmic analysis, reputation systems, and digital platforms can transform urban infrastructures into personalized services, enhancing convenience and efficiency. Slogans such as "City as a Service" or the "City on-Demand" (Hwang, 2008; Klassen and Buske, 2018) have served as rhetorical devices to promote such a vision.

Following Agre's seminal work (1997), we may understand these slogans as "generative metaphors." Generative metaphors are not merely descriptive; they shape the discourse surrounding what they describe and influence its development. In fact, a generative metaphor can dominate how society perceives a phenomenon, causing aspects that do not align with the metaphor to be marginalized or overlooked. Hence, Wakkary (2021) highlights the importance of engaging in a critical technical practice that analyzes and deconstructs the dominant generative metaphors in our society. Through this process, critics can introduce alternatives that focus on marginalized issues and concerns, and develop new techniques, methods, and priorities.

In recent years, including within this journal, numerous authors have applied critical technical practice to the discourses of the Smart City (e.g., Ashton et al., 2017; Brevini and Pasquale, 2020; Foth et al., 2015; Kitchen, 2014a, 2014b, 2014c; Lake, 2017; Pasquale, 2015; Rijshouwer et al., 2022; Smith, 2020; Zook, 2017). Building upon this body of work, we propose the "City as a License" as an alternative generative metaphor to the The City as a Service. Through this lens, we frame Smart City platforms not as consumer service providers, but rather as "rights management systems" that provide or deny access to urban resources based on pre-set conditions and algorithmic decision-making.

We are not proposing the uncritical adoption of this generative metaphor, but rather argue that juxtaposing it with metaphors such as The City as a Service offers a different perspective and reveals new possibilities for critical consideration. By focusing on licenses rather than services, we seek to understand the city as a complex arena of rights, access, and agencies. Moreover, with the generative metaphor of The City as a License we seek to highlight how the complex assemblages of new technologies, their institutionalized data practices and uptake in everyday life have started to become actants in the governance of urban spaces, resources and communities.

For us, this perspective has become especially urgent with the rise of new data practices around the emergence of distributed ledgers, such as blockchains, as they introduce additional layers of complexity to the "algorithmic governance" of cities (Gillespie, 2017; Yeung, 2018). This is particularly due to their affordance to tokenize resources,

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identities, and rights and hence to identify, authenticate and authorize users and their resources.[1] These acts can even be automatically and conditionally executed through so-called smart contracts (or automated scripts).

Following Wakkary's prompt to explore alternative metaphors, for this special theme, we are especially interested what alternative modes of urban governance such emerging data practices around distributed ledgers may bring about. In the past few years, various authors have explored whether distributed ledgers could spark less extractive and more collaborative forms of urban governance. Distributed ledgers, they have demonstrated, could be designed in such ways that they foster peer-to-peer and urban commons projects in a civic economy (Antoniadis, 2018; Bauwens and Pazaitis, 2019; Boiler, 2015; Pazaitis et al., 2017; Pitt and Diaconescu, 2014; Rozas et al., 2021a). The City as a License, then could act as a lens that brings out opportunities for alternative, currently still more marginal, systems of urban rights management, while at the same time keeping out a critical eye towards such claims. As interesting as these alternatives may be, they are not immune to repeating the inequities and obfuscations of existing systems, producing unintended consequences through complex processes, and complicating accountability.

The right to the blockchain city

Initially described as "a future in which (semi-)autonomous digital systems administer rights and access to a broad variety of urban resources" (Elsden et al., 2019), the concept of The City as a License was first developed in a speculative design workshop on civic blockchain futures organized in Amsterdam in 2019 by the guest editors of this special theme and further explored in a contribution to Frontiers in Sustainable Cities (Elsden et al., 2019; Gloerich et al., 2020). To develop the theme further, the editors organized a series of lectures in Amsterdam[2] and staged a workshop with an open call for participation in the context of the Media Architecture Biennale that took place online in June 2021. Participants in these lectures and workshop were invited to detail their insights in a contribution for this special theme.

We underline how The City as a License was never a desirable design objective but rather a thought experiment to critically explore the potential of distributed ledger technologies (DLTs) applied to Smart Cities. The metaphor of The City as a License provides valuable heuristics for unpacking the societal implications of smart technologies for governance. It offers a counterpoint to The City as a Service and related models, which emphasize the usability and efficiency of service provisions. The concept of service implies a relatively passive citizen/user who is served, whereas viewing the city as a set of licenses draws attention to the structural, situational, or temporary differences in rights and access among citizens in relation to these services.

The City as a License prompts questions related to power, inclusion, and justice. By interrogating this metaphor, we critically examine and explore the implications of smart technologies for urban governance from the perspective of citizenship and rights, and connect them to broader discussions about smart cities, platform urbanism (Barns, 2020), urban governance, and the right to the city.

Particularly, we seek to connect the broader debate about the "right to the city," as put forward by the French philosopher Henri Lefebvre (Lefebvre et al., 1996), with the emergence of Distributed Ledger Technologies (DLTs). Recently, Lefebvre's work has seen a renewed interest from critics of smart cities. For example, Foth et al. (2015) criticize the dominance of engineering and technology-centric perspectives embedded in proprietary Smart City visions. Similarly, Kitchin et al. draw inspiration from Lefebvre to reframe and reimagine the Smart City as an emancipatory and empowering project that benefits all citizens, not just select populations (Kitchin et al., 2018; Cardullo et al., 2019).

Initially conceived as infrastructure for monetary transactions in cryptocurrencies, blockchain-based DLTs have recently been proposed to govern a much broader range of human activities. The central promise of DLTs is to enhance trust among individuals and institutions by leveraging the immutable data storage and automated actions of blockchain facilitated through smart contracts. Murray-Rust et al. (2021) describe distributed ledgers as complex systems composed of append-only immutable databases, consensus algorithms for validating transactions, programming languages for coding automated conditional transactions in smart contracts, and currencies administered within the database. These systems also rely on external actors who develop apps, program smart contracts, or interface with other systems, such as banks.

For our purposes, we have distilled these complex assemblages into a set of "mechanisms" that enable new or qualitatively different types of data-driven interactions in urban management. The most important one, as Rozas et al. (2021a) have pointed out is tokenization. This means the conversion of specific assets or rights into transferable data elements known as tokens. Expanding on this notion, Cila et al. (2020) understand distributed ledger-based systems as facilitating processes of tracking, managing, and negotiating. Similarly, Verhulst et al. (2018) propose identity management, tracking, tracing, smart contracting, and transactions as key attributes of DLTs. Starting from tokenization, we could argue that DLT-based urban assemblages for the management of communities, resources and infrastructures can be characterized by their ability to:

- keep track of urban resources and their use or status (Tracking);
- keep track of and authenticate the identities of users, including their status, reputations, and set privileges (Identity Management);

- manage rights such as ownership of a resource and conditions of usage (Notary, Rights Management);
- Automatically and conditionally execute transactions or actuate external processes (Resource Management & Governance).

Combining these mechanisms, DLTs can administer ownership of resources and determine the conditions under which they can be accessed. They can automatically and conditionally execute transactions or involve token-based right holders in voting on specific conditions and their consequences. Additionally, the append-only structure of the database and the consensus algorithms that validate transactions operate without a central authority, enabling decentralized urban management schemes. However, these systems are often highly rigid and, once specific rules are encoded in smart contracts, they become difficult to modify or negotiate.

De Filippi and Hassan (2016) argue that the rise of DLTs and smart contracts could lead to a qualitative shift in the role of laws, rules, and regulations in society. They propose that algorithmic regulation represents a fourth phase in the relationship between law and technology, characterized by a "code-ification" of law. This means that laws and rules are increasingly written and interpreted as software code. Algorithms are not only used to enforce legal code but are also utilized to express legal and technical rules through software code. This shift blurs the lines between legal and technical rules, as smart contracts can serve as both a support and a replacement for legal contracts (De Filippi and Hassan, 2016).

Such a development is likely to promote governance over government (Rhodes, 1996) and could accelerate a shift from territorial to functional sovereignty, as discussed by Pasquale (2017). In this shift, the territorial jurisdiction of state and local governments gives way to encoded rules that operate in various functional areas such as transportation, housing, or delivery services, executed through instances of what Barns (2020) has called platform urbanism. The development of DLTs is expected to extend these trends further, introducing decentralized models of algorithmic governance and facilitating transactions between pseudonymous actors through largely immutable and pre-determined programmable logics. This could make cities – complex systems already – even more complex with a broad variety of technologically mediated governing systems regulating access to various resources stacked on top of each other, each with its own currency, privileges, rule sets, user rights, expressing a variety of underlying values.

From "big data" to micro-transactions in algorithmic regulation

Such a potential for fragmentation and decentralization is a crucial point for the implications of rights management in the city, as it brings along new affordances for what we could call micro-transactions and micro-regulation. Actors, from local civic organizations to internationally operating companies, can set up accounting and bookkeeping systems keeping track of transactions and resource use in their own token or (crypto)currency. Similarly, smart contracts allow for micro-regulation. They could be programmed in such a way that a specific token is only valid at a specific geo-location, time, or set other conditions that may validate a token and (dis)qualify users to access a corresponding resource (e.g., Nissen et al., 2018).

The metaphor of the City as a License enables us to both critically analyze current developments as well as envision speculative scenarios that explore the implications of these micro-transactions and regulations. For instance, as documented in Gloerich et al. (2020), in our workshop we envisioned a system where parking places could be programmed to autonomously run a service governed by a blockchain-based DAO that checks rights and priorities concerning who is entitled to use a parking space. A physician might be granted a free parking license that is valid only when visiting patients, an ice-cream truck might be allowed to use a parking spot for a fee that is proportional to their revenue, and car owners might be allowed to park at a price tied to their age and (assumed) need for easier mobility.

It's a scenario that's not far off from current research experiments in the domain of logistics and urban transport, where researchers have started to experiment with Vehicular Ad Hoc Networks (VANETs) (Bushan et al., 2020; Jennath et al., 2019). These are impromptu networks of (self-driving) vehicles that communicate their position, speed and destination to one another, and then can calculate more or less efficient routes and reserve parking places and set priorities or possibly dynamically priced tariffs for accessing these resources. Here, DLTs could be used to keep track of the status of the system as a whole (road congestion, blockages etc), and for rights management (e.g., which roads or parking places are accessible to which actors under which conditions).

Our blockchain-based parking system does not exist yet – and, perhaps, it should never be implemented – but as we have argued (Gloerich et al., 2020), speculating about it reveals questions that are useful for teasing out the desirable and undesirable characteristics of DLTs as governance tools. Which values are encoded in the DAO? Who decides how to prioritize the parking rights (if such a right exists) of visiting physicians, senior drivers, and food trucks? What are the underlying values and local practices, how are they translated into algorithmic rules, and who has the agency to establish and change them? And once set, to what extent can they still be interpreted or negotiated? Is it still possible to make exceptions when rules are encoded in software? Do these systems produce new governmentalities, in which citizens start to internalize the logic of the system in their perception of the world and

everyday behavior? Imagining our cities increasingly governed by algorithmic systems that give out licenses for the use of urban resources makes the debate around DLTs, urban governance and civics much more tangible and concrete.

Imagining civic alternatives

As mentioned above, for this special theme we were especially interested in exploring alternative models for urban governance and the affordances of DLTs for the accounting and management of alternative social economic systems. In such light, the City as a License connects debates about data practices, algorithmic governance and digital civics (e.g., Vlachokyriakos et al., 2016). Scholars in this field explore avenues to encode certain rights and democratic principles into the way algorithmic governance is set up in DLTs (Barbara, 2019; Bauwens and Pazaitis, 2019; Cila et al., 2020; Fritsch et al., 2021; Rozas et al., 2021a, 2021b). For instance, various initiatives are experimenting with setting up blockchain-based management systems for commons-based local resource management (Balbo, 2018; Cila et al., 2020; Rozas et al., 2021a). Contributions, usage rights and depletion of resources are managed on a blockchain, for instance using cryptocurrencies. Furthermore, such examples imply the potential for communities or groups of service users to be given greater control over local decision making. In ad hoc online communities and DAOs, DLTs (e.g., https://snapshot.org/#/) underpin voting infrastructures allowing diverse and anonymous groups of individuals to co-ordinate and make decisions about pooled funds and projects.

The rise of such systems of data-based urban governance facilitating micro-transactions and micro-regulation through DLTs may also contribute to what DiSalvo has called a diversification of civic imaginaries (DiSalvo, 2022). Based on the work of Gibson-Graham (2008, 2016), he argues that we must develop an understanding of civics that goes beyond a singular mode for the organization of civil society. Just as there is no such thing as "the economy" (but rather various systems with their own logic interacting with one another such as the market, voluntary work, worker cooperatives, etc.), civic organization could be shaped in a myriad of ways. As the experiments of Balbo (2018) or Barbara (2019) show, DLTs open up multiple ways for organizing local civic economies, based on hyper-locally set rules and regulations. Indeed, such systems open up the potential for radical new formations of "local" – as more than a geographical range, but related to groups united in shared practices, be that parents of children at a certain school, or sports or music fans in town for the weekend.

The contributions in our special theme further explore alternative ways of urban governance through socio-technical systems. Their explorations delve into pro-social

and sustainable ways of governing and managing communities, often based on principles of the commons, while also uncovering the detrimental effects of implementations that fail to consider their social, political, and economic surroundings. These explorations extend beyond the design of the data technologies themselves and aim to highlight the articulation of their underlying values, the practices of data collection, and the analyses built around these systems.

What unites the various contributions in this special theme is their critical examination of the blockchain's impact on the administration, management, and allocation of public and civic resources and rights. The articles in this special theme share a common interest in understanding how the design of DLT-enabled civic infrastructure influences the formal and informal social dynamics that they support. Additionally, there is a pervasive reflection on the social and political values implicitly embedded in current and future DLTs throughout the volume. Lastly, the various authors contributing to this special theme do not take for granted the tech-driven narrative surrounding "blockchain for good"; instead, they approach it critically from multiple perspectives.

Nguyen Long and colleagues (https://journals.sagepub.com/doi/10.1177/20539517231182391) draw on Ostrom's concepts of institutions and polycentricity to explore the governance of commons in hybrid urban spaces. They describe how cities have become increasingly governed through multiple (technological) systems, operated by numerous actors and based upon a variety of value systems. They seek to understand how, in such a context, the application of DLTs can strengthen the agency of citizens to take ownership of collective urban resources and govern them in non-extractive and prosocial ways as a commons. In their examination of the affordances of DLTs for the governance of urban commons, they consider how guiding principles such as social justice can be incorporated into the mechanisms through which a city is planned, managed, and lived in. An important question here is how a broader technology enabled shift from relational to transactional approaches of urban governance and rights management can be countered by opening up the design of DLTs to non-institutionalized shared values such as kindness and dignity.

Montakhabi and colleagues (https://journals.sagepub.com/doi/10.1177/20539517231205503) make such explorations more concrete, by investigating the use of DLTs to foster the energy transition in cities and its implications for the role of citizens in the governance of the energy market. The authors introduce three possible market models that may emerge in the near future, and link these to insights into urban governance concepts built on how blockchain can facilitate (or hinder) the implementation of token-based models for electricity/flexibility trading. Through a case study approach, Montakhabi and colleagues further detail these three market models, their supporting trading

mechanisms, and the pros and cons of applying permissionless and permissioned blockchains based on an algorithmic method. What sets these three models apart is their variation in autonomy and autarky for citizens and their communities to set their own rules of engagement, for instance when deciding to prioritize sustainability, solidarity or individual profits. Although the development of these three models is still in its infancy, the authors see an opening for the emergence of an ecosystem approach, "fostering a more responsible innovation and a system value-based-approach," departing from a platform urbanism in which governance and rights management is usually tuned to the interest of corporations or the nation state.

To explore the design of such systems, and their implications for urban governance, Kostakis and colleagues https://journals.sagepub.com/doi/10.1177/20539517231180583 introduce the concept of "mid-tech". In their commentary, they show how hi-tech Smart City solutions – including those making use of DLTs – are often positioned as seamless technologies that make life easier for their users, promising higher efficiency or better democracies. However, such propositions often come at the cost of user agency, as they are confronted with a (hopefully) well-designed but black-boxed system. Moreover, these smart technologies often include hidden externalities in the form of high energy use, extractive labor practices in their production, and/or the use of rare metals mined at high environmental costs. Rather than foregoing the advantages of such technologies altogether and opting for low-tech alternatives with lower and mostly localized impact, a mid-tech perspective explores the positive affordances of new technologies. It does so by investigating the social and ecological externalities the technologies may bring about, as well as granting citizens agency in the design and governance of its actualization.

The unintended social effects of blockchain-based technologies "for good" applied to governance are addressed by the final two articles in the special theme. Crandall https://journals.sagepub.com/doi/full/10.1177/20539517231208455 critically examines the proposed adoption of blockchain-based infrastructure for land/property documentation, ownership, and inhabitation, including land surveys, title creation, and the transference of land/property rights. By questioning the utility and limits of datafication, she explores whether "tokenized equity" as framed by proponents of blockchain-based land management is genuinely equitable. The author compares various DLT projects that claim to inject equity into the system, propose alternative housing economies, or support land rights and data sovereignty. She teases out the socio-political implications of numerous real estate and land right focused DLT proposals and argues that they mostly act as exclusionary digital platforms that facilitate predatory formations to accumulate wealth. Even projects that aim to operationalize DLTs for more equitable and socially just housing schemes, do so in the confinement of capitalist property regimes, as regulation currently makes

alternatives difficult or impossible to realize. So far, she argues, it is mostly the more speculative projects that do open up alternative imaginations for property regimes and rights management systems based on care and solidarity.

Finally, as many blockchain-related initiatives claim to leverage DLTs for "doing good," Semenzin https://journals.sagepub.com/doi/full/10.1177/20539517231205479 addresses the lack of systematic research on the notion of "good" itself that underpins their implementation, particularly in relation to social justice theories. The author argues that blockchain, like any other technology, is not neutral. In the developer communities she researched the concept of social good is not conceived by its creators as related to social justice tropes such as distribution, recognition and representation. Rather they understand social good in rational, mathematical terms connected to a neoliberal imaginary that does not consider structural inequalities as relevant issues to address. The author draws parallels between the "blockchain for good" discourse and a "Californian Ideology" that frames ICTs as tools to empower the individual, enhance personal freedom, and radically reduce the power of nation-states.

Conclusion

We argue that The City as a License provides a generative metaphor that facilitates a critical examination of Smart Cities from the perspective of citizenship and rights, while connecting to broader discussions on DLTs, (algorithmic) urban governance, and the right to the city. It may be a valuable tool for researchers and stakeholders to critically inquire into the implications and potential of DLTs (and other "smart" technologies governing our cities) in shaping the future of urban environments. It invites imaging and exploring alternative systems of urban governance, but – as seen above – at the same time forces us to remain critical and stay away from techno-optimistic solutions.

The examples, promises, and caveats discussed above highlight the shift of power from traditional legal rules to code-based protocols governed by decentralized blockchain networks. This shift emphasizes the importance of conducting critical research at the intersection of DLTs, Smart Cities, and algorithmic governance. Citizens navigating a "blockchain city" may encounter complexities, including multiple identity schemes, wallets with various currencies, and different functional systems with their own reward and reputation mechanisms. Understanding and untangling these dynamics is essential for ensuring inclusive and effective resource management.

The articles presented in this special theme serve as an initial step in this direction, but further investigation is urgently needed. While this special theme focused on the affordances of distributed ledgers, we are aware that many of the themes pertinent to Smart City urban

governance also relate to other emerging technologies that allow for datafication, tokenization and algorithmically enabled rights management. Hence, we argue that The City as a License and the critical technical practices that emerge around it as a generative metaphor resonate with debates in the broader context of technologically mediated urban governance.

Future research should focus on understanding where and how such systems gain traction and impact existing forms of local and urban governance, and what alternatives they may make possible. We believe it is crucial to continue exploring the implications and challenges of DLTs and other technologies in Smart Cities to ensure equitable and sustainable urban development, and we offer this special theme as a contribution in that direction.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

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Notes

1. See Maserio 2023 and Nyst et al. 2016 for more on digital identities understood as digitally performed functions of identification, authentication and authorisation.
2. https://circulateproject.nl/2021/05/31/circulates-livecast-series-rights-to-the-blockchain-city/

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