

Invisible Infrastructure for Visible Markets

Metrc and the Legal Markets for Cannabis In Colorado

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INVISIBLE INFRASTRUCTURE FOR VISIBLE MARKETS:

METRC AND THE LEGAL MARKETS FOR CANNABIS IN COLORADO

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Introduction

As you enter Denver from the airport, it is easy to be impressed by the skyscrapers emerging from an increasingly busy skyline. To understand that skyline, however, one needs to look down rather than up. To grasp the foundations upon which those skyscrapers emerged, scholars of science and technology remind us that we need to attend to the infrastructures—physical infrastructures such as roads, rail, and water as well as the digital and legal infrastructures—which make these marvels possible (Bowker et al., 2010; Lampland & Star, 2009; Star & Ruhleder, 1996). It is said that only by investigating these mundane and often invisible things, as well as their maintenance and repair (Graham & Thrift, 2007), that we can truly grasp the skyline and how it emerged.

This paper advances an analogous argument in order to understand another transformation, the construction of a fully regulated legal market for cannabis in Denver and across the state of Colorado. We argue that to understand the distinctive form of this market, which now surpasses \$1 billion in annual sales, we need to attend closely to the underlying and often invisible infrastructures which are shaping its development.

Infrastructures are multiple and overlapping, but if there was just one piece of infrastructure underpinning the legal market for cannabis in Colorado, it would be the seed-to-sale inventory accounting system known as Marijuana Enforcement Tracking Reporting Compliance (Metrc) (formerly the Marijuana Inventory Tracking Solution). Metrc tracks every plant in cultivation, from the point of viability to the end user using a barcode system that is computerized and accessible to regulators.

Many researchers have drawn attention to the importance of Metrc for regulatory purposes. An influential report from the Brookings Institute describes Metrc as “technologically advanced, comprehensive, and serves as the backbone for the regulatory regime’s enforcement activities” (Hudak, 2015: 9). It serves this regulatory function by establishing a distinction between legal and illegal cannabis markets. Speaking very simplistically, cannabis which is accurately recorded into Metrc is legal, while everything that is not is illegal.

This distinction allows regulators at the Medical Enforcement Division (MED) in the Department of Treasury, the state's principal regulator, to detect and act against diversion and other sources of harm. Inspectors are able to download a full inventory of legal cannabis before they enter a facility and therefore determine any product that is being illegally produced. Moreover, cannabis that is accurately recorded in Metrc can be carefully monitored and controlled. A record of the chain of custody allows potential diversion to be identified and traced to the source, and products which are contaminated to be recalled. The collection of ever more data is allowing the MED to move from a reactive assessment regime to one that is proactive and risk-based (Hudak, 2015).

Metrc, in summary, serves as a powerful “regulatory technology” (Williams, 2013). It is a system that illuminates the entire market to those tasked with overseeing it. In doing so, Metrc gives regulators the ability to distinguish between markets, legality and illegality, and hence to identify and intervene in situations of diversion, fraud, etc., even without deep knowledge of the product itself and the production process.

Metrc as market infrastructure

Understanding Metrc as only a regulatory technology, however, overlooks its wider and more constitutive role as market infrastructure. Metrc is first and foremost a regulatory technology built for the MED, yet it is important to highlight that it is also becoming the backbone of much market and operational activity. In practice, for instance, Metrc provides many of the basic components for ‘grow management’, the movement of the product between facilities, as well as for basic business functions such as manifesting and inventory management.

Metrc is therefore not just a regulatory technology. It is rather better understood as an infrastructure, like the highway system ringing Denver, which has multiple and overlapping users, functions, and uses, both material and symbolic. Understanding Metrc in this way draws attention to three defining features: its relationality, its generativity, and the form of decentralized control upon which it operates. Outlined in the next three sections, these concepts help to illustrate the unique significance of Metrc in the development of a distinctive market for cannabis in Colorado.

Relationality

Infrastructure is multi-modal, meaning that it operates to connect and relate people, things, and ideas (Star & Ruhleder, 1996). Infrastructure conjures the image of technical achievements: bridges, dams, or roads, for instance. But, as anthropologists have highlighted, these technical achievements are also and simultaneously social, cultural, and political (Bijker, Hughs and Pinch, 1987; Bowker & Star, 1999). This is illustrated when we think of the seemingly technical infrastructure of roads; to operate, roads require organizational and institutional elements (car manufacturers, petrol stations, insurance companies, legal frameworks, police and law enforcement agencies, etc.), and they also require cultural elements to understand of how to use them (imagine the cultural skills it takes to cross a road in New Delhi as opposed to Denver!). To speak of infrastructure, therefore, is to speak of the way in which a variety of dispersed and different elements (laws, materials, norms, etc.) are related to each other.

To understand Metrc, it is essential to think in similarly relational terms. Metrc is a technical device, but it is also highly social and symbolic for its users. Within the cannabis industry, symbolism is extremely important. Throughout history, cannabis has been a symbol of all kinds of fears and frustrations: of crime, predation, immigration, etc. (Hudak, 2016). As a result, those participating in the legal cannabis markets feel a great need to differentiate themselves from these associations and to demonstrate relations to commerce, social responsibility, good corporate citizenship, medical care, etc.

As highlighted above, Metrc functionally distinguishes between what is legal and illegal. It also, and because of this, provides essential symbols for operating at a higher standard. Speaking to owners and operators about what is different about the legal market they often and with great pride draw attention to Metrc and its trappings: to the Metrc stations carefully stationed throughout the facility, to the compliance officers and their focus on ensuring the data is recorded in the system, as well as to the plant tags, waste logs, standard operating procedure (SOPs), shipping manifests, etc., of which Metrc is a part—these are things that differentiate legal and

commercial operations from illegal ones, as well as others that might be a bit less compliant or a bit more care-free.

Understanding this symbolic function of Metrc highlights that it is not only a regulatory system and a burden on regulated entities. For those operating in the legal market, it is also possible that Metrc is a symbolic resource and possibly even a source of competitive advantage. It differentiates between regulated entities and markets, and not just in the sense of the data it provides. Rather, it symbolically illustrates differences which are necessary for market legitimacy; in a market that still has the trappings of illegality (the need, for instance for safes, security, and a large amount of cash on hand), it provides the essential symbolic tokens for differentiation, which is important for businesses seeking to raise capital and pursue other such aims. Understanding Metrc as a relational infrastructure highlights that its operational requirements (e.g. data entry) are also a source of symbolic value. Far from simply a matter of compliance, they may be used strategically by operators to demonstrate their legality.

Generativity

Infrastructure also needs to be understood as *generative*. It does not reveal or record what already exists, but helps to provoke or disclose reality. Think, for instance, of the relation between the early American rail infrastructure and the Great American West comprised of settlers, towns, disputes, opportunities, wars, etc. These things did not lie pre-formed and waiting to be uncovered; rather, they took shape through the possibilities forged by the laying of each additional piece of track, the connections it allowed, and the prospects it afforded. To understand Metrc as infrastructure we need to understand it, similarly, as a technology that discloses new possibilities.

The sense in which Metrc discloses the market can be seen in the way that it constitutes a distinction between legal and illegal without knowledge of its underlying object. It is important to appreciate that the form and status of the cannabis market that is emerging from the shadows was and remains essentially unknowable—subject to decades of prosecution and forced underground even basic facts about its psychoactive properties and its active ingredients remain

unknown (Schultes, Hofmann and Rättsch, 2001). Yet, what the market is becoming relates in two ways to what Metrc provides.

On the one hand, Metrc imposes order on the product, producers, and production processes through the establishment of standards and categories throughout the industry (Bowker & Star, 1999). Metrc employs several technical features, which configure the way in which production and the product is understood. Metrc, for instance, embodies a particular grow logic (suggesting that plants move between rooms as each stage of the growth cycle). While the system can be worked with to match a variety of grow processes, we find cases in which those processes are instead designed to fit the logic of Metrc, for instance by creating physical rooms to mirror Metrc's digital ones. Similarly, Metrc embodies a certain set of parameters for understanding the product, by categorizing it in terms of the "strain" name and the "THC" and "CBD" content determined through testing. These classificatory standards represent just one of many understandings of the product. The strain name, for instance, is a lay classification that carries over from the black market and has little relation to genetics or other characteristics. "THC" (tetrahydrocannabinol) and "CBD" (cannabidiol), similarly, are two of possibly hundreds of active ingredients in cannabis. And yet, these distinctions are amplified and stabilized as they come to operate as infrastructure and therefore as the foundation for other devices such as price and product comparison websites, budtender training, and education.

On the other hand, the product, producers and the production processes impose order on Metrc and the knowledge that it provides. Metrc functionality, for instance, might be challenged by outdoor and greenhouse growing possibilities: in these situations, plants cannot be moved between rooms for instance, and common practices such as top-cutting (this is where only the top part of the plant is harvested) are difficult to register. These kinds of grows, and other innovations, appear abnormal in Metrc and may trigger an investigation from MED inspectors. However, they often allow regulators to learn more about market innovations—that is, to recalibrate their understanding of the underlying objects to which their regulatory dashboards pertain. It is important to highlight, however, that operators may have disincentives to engage regulators in this

kind of discussion. Because it requires the possibility of triggering an inspection only those with the resources to explain production processes to inspectors, and engage regulators in discussions about compliance, are likely to challenge the meaning of Metrc data itself.

These two processes illuminate the sense in which Metrc is involved in the disclosing of the market. Metrc counts, tracks, and records, but it is never certain to what these things refer. It is only therefore through the mobilizations of Metrc in practice, either to conform to Metrc or to innovate, that the reality of the market for recreational cannabis will emerge.

Decentralization

We also need to understand infrastructure as embodying a distinctive kind of control. Unlike traditional forms of organization and control, infrastructure operates by simultaneously centralizing power and decentralizing control. This is the case because, fading into the background, infrastructure becomes a platform or protocol: a standardized system of rules adopted across a field. Think, for instance, of the market infrastructure provided by internet commerce platforms such as eBay. Reaching a critical mass of users, eBay affords the platform owners extraordinary power, for instance to dictate what can and cannot be sold on the platform and on what terms. It does this, however, by distributing control of the infrastructure to the millions of users that—by clicking, uploading photos, judging quality, etc.—make the platform run. eBay, like all infrastructure, therefore, operates through a deep and symbiotic connection between decentralization of control and the centralization of power. This relationship between power and control is important to highlight in the operation of Metrc.

Metrc radically decentralized control by delegating the input and use of Metrc to users across the market. This has allowed Metrc, like the standard communication rules of the world-wide web, to become a kind of protocol upon which new kinds of activities emerge. The RFID tagging and tracking of the plant grow cycle, for instance, has become the foundation for third party grow optimization solutions. Similarly, the manifesting requirements of Metrc have become the foundation for a number of operational tasks such as invoicing and record keeping. The recent

addition of application program interface (API) functionality to Metrc is likely to further its decentralization, but opening up ever more possibilities for Metrc to become an input into new systems and activities.

This decentralization has a direct relation to Metrc's regulatory power. It is because Metrc is intertwined with these operational tasks and activities, as opposed to being a stand-alone task of compliance, that Metrc receives an extraordinary amount of operational and unfiltered data. Metrc gives a clear view of regulated organizations precisely because, or to the extent that, it is constituted by the building blocks of the organizations themselves. The accumulation of such data, moreover, centralizes the power of the MED; at a scale capable of data analytics, and allowing its users to report any set of operational activities, Metrc might allow the MED to not just to detect, but to predict in advance the movements that are associated with illegality or fraud.

The decentralized nature of Metrc, alludes to a potential tension underlying its use as a form of governance. Since the MED's power relies on decentralization, it also relies on the continued cooperation of those decentralized actors that control the system. The challenge for the MED, therefore, is likely to mirror that of other platform owners such as Facebook and eBay: how to ensure the continued and active use of the platform in a way that does not erode the owner's benefits in terms of knowledge and power. While the MED has a strong legal foundation for maintaining compliance, it is likely that it will encounter pressures from users to add ever more functionality to Metrc, even if it erodes its regulatory value. With access to the API, for instance, a third-party system could be developed that limits the possibilities for those using the system to input that kind of incriminating data that regulators have designed Metrc to collect. The challenge of ensuring continued functionality *and* regulatory value is one that Metrc, understood as infrastructure, makes clear.

Conclusions

This short thought piece has sought to undertake what science and technology scholar, Geoffrey Bowker (1994) has described as an "infrastructural inversion"—foregrounding those mundane and

often-overlooked 'backstage' technologies and work practices which make the 'frontstage' spectacles function. This meant that, rather than taking Metrc as a taken-for-granted regulatory device that imposes control and order on an (existing) market, we have investigated how the mundane tasks of Metrc (data entry, manifesting, workstations, etc.) as well as its design help in the construction of the market itself.

Exploring how, as infrastructure, Metrc operates relationally, generatively, and through a form of decentralized control highlights connections between elements that are often seen to act in a stand-alone manner. It shows that what is operational about Metrc is simultaneously symbolic; that what imposes order also generates possibilities for learning; and that what centralizes power also decentralizes control.

What are the implications of these reflections for the users of Metrc (regulators, practitioners, and policy-makers)? Primarily, this paper highlights the dangers inherent in allowing Metrc to become an activity which fades into the background and goes un-noticed. This property of becoming invisible, at least until breaking down, is an inherent property of infrastructure (Bowker & Star, 1999): because it is mundane and ubiquitous, its users tend to take it for granted (reflect, for instance, about how often one thinks about the road infrastructure we use to get to work and the digital infrastructure that it takes just to read this article!).

However, it is precisely when Metrc goes unnoticed that practitioners and regulators should start to worry and reflect. This is the case for two reasons. Firstly, the invisibility of Metrc will mean that it no longer operates as a source of symbolic value. When this is the case, Metrc will become a back-office compliance task, understood only or largely as a burden for businesses. This, in turn, will decrease its regulatory value because less attention will be given to data entry, compliance, and building out the system to operate for ever more tasks. Secondly, the invisibility of Metrc will mean that it is not being used as for learning and innovation purposes. While the development of Metrc, to the extent that it operates seamlessly and only detects instances of fraud, might be seen as a success, it would also indicate that there are little process and product innovations

and/or that these changes have become decoupled from the data entered into the Metrc system. While regulators might aim ultimately to establish a kind of long distance control over the market, it is only by detecting Metrc anomalies and engaging in discussions and learning about the innovations and activities to which these anomalies relates that Metrc and the market will co-evolve.

Hence, this paper concludes with a rally cry for continued attention to the background and mundane activities that sustain and shape the market (Woolgar and Neyland, 2013). Only by focusing on such backstage work around Metrc and other technologies, can we begin to understand how the front stage actors, the regulators, license holders, policy-makers, etc. engage in market creation.

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Works cited

- Bijker, W. E., Hughes, T. P., & Pinch, T. eds. (1987). *The social construction of technological systems: New directions in the sociology and history of technology*.
- Bowker, G. C. (1994) "Information mythology and infrastructure" in Buud-Frierman, L. (Ed.) *Information acumen: The understanding and use of knowledge in modern business*. 237-247. London: Routledge.
- Bowker, G. C., Baker, K., Millerand, F., & Ribes, D. (2010). Toward information infrastructure studies: Ways of knowing in a networked environment. In *International handbook of internet research* (pp. 97-117). Springer Netherlands.
- Bowker, G., & Star, S. L. (1999). Sorting things out. *Classification and its consequences*. MIT Press: Cambridge.
- Graham, S., & Thrift, N. (2007). Out of order understanding repair and maintenance. *Theory, Culture & Society*, 24(3), 1-25.
- Hudak, J. (2015). Colorado's Rollout of Legal Marijuana Is Succeeding: A Report on the State's Implementation of Legalization. *Case Western Reserve Law Review*. 65(3): 649 -687
- Hudak, J. (2016). *Marijuana: A Short History*. Brookings Institution Press.
- Lampland, M., & Star, S. L. (2009). *Standards and their stories: how quantifying, classifying, and formalizing practices shape everyday life*. Cornell University Press.
- Schultes, R. E., Hofmann, A., & Ratsch, C. (2001). Plants of the gods: Their sacred, healing, and hallucinogenic powers Healing Arts Press Rochester, VT.
- Star, S. L., & Ruhleder, K. (1996). Steps toward an ecology of infrastructure: Design and access for large information spaces. *Information systems research*, 7(1), 111-134.
- Williams, J. W. (2013). Regulatory technologies, risky subjects, and financial boundaries: Governing 'fraud' in the financial markets. *Accounting, Organizations and Society*, 38(6), 544-558.
- Woolgar, S., & Neyland, D. (2013). *Mundane governance: Ontology and accountability*. Oxford University Press.

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