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# Histories of Infrastructuring

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## Abstract

This paper outlines the evolution of my work to narrate the history of Aadhaar, India's biometrics-based national identification infrastructure, in one of my dissertation chapters. I describe how and why this seemingly simple task of narrating a 20-year history of an infrastructure eventually expanded to cover a 200-year history of infrastructuring unique identification of residents in colonial and postcolonial India. I conclude by arguing that focusing on *histories of infrastructuring* is not only a useful method and heuristic to historicize information infrastructures, but also an effective tactic to leverage the past to inform their design, implementation, and use.

## Author Keywords

infrastructuring; infrastructural inversion; accountable cuts; fixes; Aadhaar.

## ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

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## Introduction

“What can be studied is always a relationship or an infinite regress of relationships. Never a ‘thing.’”

— Gregory Bateson [quoted in 17:112]

In the summer of 2019, I took on the task of writing my dissertation chapter outlining the history of building and using India's biometrics-based national identification infrastructure, Aadhaar. It began as a relatively straightforward task. After all, the history of Aadhaar usually begins with national security concerns after a war between India and Pakistan in 1999 [1]. In 2001, the center-right government released a report, which noted that, “Illegal migration has assumed serious proportions. There should be compulsory registration of citizens and non-citizens living in India. [...] All citizens should be given a Multi-purpose National Identity Card (MNIC) and non-citizens should be issued identity cards of a different colour and design” [as quoted in 14:155–156]. These plans changed when a center-left government came to power in 2004. The new government introduced Aadhaar with the ambition to assign biometrics-based unique identity numbers to below-poverty line families and streamline targeting of welfare beneficiaries [1]. The project was later expanded to every Indian resident to determine their entitlement to government services “through a single system rather than all government departments individually and independently investing” resources to identify residents [8:1288]. Initially, the plan was to collate the datasets of MNIC and Aadhaar [13]. However, as Aadhaar became pervasive and social security became the core rationale for implementing it, this plan was shelved. It was revived again after Aadhaar became the largest biometric database in the world and the center-right government came to power in 2019.

Within these 20 years lies the histories of sociotechnical, legal, administrative, and policy work and controversies that have mutually shaped the trajectory of Aadhaar. My task was to narrate this 20-year history through analysis of public documents, news stories, and other written records on Aadhaar's implementation.

I soon realized, however, that such a history located the challenges in the state's efforts to uniquely identify its residents primarily within Aadhaar's technical design, implementation, and use. I kept coming back to Geoffrey Bowker's historiographical argument on information processing: "all the business advantages of being able to process huge amounts of data should not be traced back in time to the computer (which its advocates have claimed to be the source of this new ability), but to changes in bureaucratic organization which in turn made the computer possible" [2:235]. On a broader note, he addressed this focal shift as 'infrastructural inversion': "Take a claim that has been made by advocates of a particular piece of science/technology, then look at the infrastructural changes that preceded or accompanied the effects claimed and see if they are sufficient to explain those effects — then ask how the initial claim came a posteriori to be seen as reasonable" [2:235]. Following Bowker's recommendation, I shifted my historical narrative from situating Aadhaar as a technical solution to the problem of unique identification to describing changes in the Indian state's practices that created and leveraged Aadhaar. In my historical account of *infrastructuring* the relation between Aadhaar and unique identification, I began to focus on the forms of sociomaterial organization that helped to create and sustain this relation. While I now had analytical clarity, the question of method remained: *How to narrate the history of infrastructuring the relation between a technology and its intended purpose?*

This paper describes my challenges with doing history. In the first section, I elaborate on my efforts to narrate the colonial and postcolonial history of the Indian state's

efforts to uniquely identify residents. In the final section, I offer a set of questions and provocations for researchers attending the workshop on *Fostering Historical Research in CSCW & HCI* to consider.

### **Infrastructuring Unique Identification**

The Unique Identification Authority of India (UIDAI), in-charge of implementing Aadhaar, has consistently promoted biometrics as a technical solution to the problem of unique identification. It has claimed that the absence of a universal and standardized method to uniquely identify residents, prior to Aadhaar, within any government database has impeded efforts to computationally streamline government services [19]. Adding Aadhaar numbers to government records was the putative solution to this problem. Starting with this claim, my work on the history of infrastructuring the relation between Aadhaar and unique identification in India was driven by the question: *How has the Indian state historically worked towards ensuring that a government record uniquely corresponds with a resident?* Breaking this question apart opens diverse lines of investigation: What were the challenges of governing India that created the need for unique correspondence between residents and government records? How was this need addressed prior to Aadhaar? What techniques were used to uniquely identify a person in government records? These specific questions on unique correspondence can be broadened even further. How was the identity of an Indian resident fixed to ascribe citizenship/subjecthood to them in the first place? How were these government records maintained by different state bureaucracies? When was a resident unique in practices of governing India?

These questions opened multiple possible directions to my historical narrative. Maneuvering through these possible directions required "accountable cuts" [18] in the labyrinth of the history of Indian state. Making these cuts was not a matter of narrating some independently existing reality of Indian governance out there, rather it

was a matter of my ability to “articulate its basis and its implication” [18:284]. Lucy Suchman argues that making accountable cuts lays the foundation for separating any object of analysis “from the more extended networks of which it is part” [18:283]. This foundational move inevitably foregrounded certain practices in my narrative at the expense of off-staging others. However, it also afforded a practical solution to my problem of managing the “specificity and reach” of a historical narrative and following “lines of connections” from a particular practice to others [18:284]. There were several ways of making these accountable cuts. One way was to rely on my field respondents’ accounts of the history of Aadhaar, which inevitably drew contrasts and comparisons with antecedent practices of identifying Indian residents and identification practices in other countries. For example, in interviews, the design team members of Aadhaar often talked about a lack of robust civil registration system issuing Birth Certificates in India and compared Aadhaar numbers with Social Security Numbers in the United States. Indeed, “*the present is shaped in the light of the past at least as much as the past is rewritten in the light of the present*” [16:298, emphasis mine]. Another way was to trace the historical narratives outlined in the affidavits filed by both parties in the public interest litigations against Aadhaar. These formal records have chronicled the trajectory of relevant laws, prior holdings in court cases, and other evidence of historical contests over unique identification for the Supreme Court of India to consider.

In making a choice among these ways, I borrowed inspiration from Michael Lynch et al. [11] who narrate a history of controversy over DNA profiling in criminal forensics in the US and UK since the beginning of its use in the mid-1980s. Lynch et al. argue that since public controversies rarely achieve complete closure, rather than focusing on ‘factors’, ‘reasons’, or ‘causes’ that imply shutting down a controversy, it is more useful to think with ‘fixes’ that “circumvent, bypass, bury, displace, and effectively extinguish recurrent sources of controversy” [11:230]. While the idea of a fix (technical

or otherwise) tends to engender critiques of positivism in histories of technological development, pragmatically they enjoin actors in a technological controversy to rally around the future(s) promised by the fix. Lynch et. al. show how multiple closures in controversy over DNA profiling was reached through a serially linked array of technical, legal, and administrative “fixes.” For example, a “legal fix” for a “scientific” controversy can be effected by a legal ruling that a forensic technique is “reliable” or “generally accepted” in a relevant expert community, while a “technical fix” that greatly enhances the discriminatory power of an available technique can persuade a court that debates over the probability of coincidental matches between a suspect’s DNA profile and criminal evidence among population geneticists are no longer pertinent. Finally, “administrative fixes” for controversies over contaminated samples can be demonstrated by pointing to proficiency tests, tightened protocols, and automated chains of custody. From the perspective of writing the history of infrastructuring a relation between DNA profiling and unique identification of a suspect, these fixes are practices of organizing the distributed work of criminal investigations in attributing bodily evidence uniquely to a suspect.

Using this vocabulary of fixes provided a resource to narrate and parse my historical narrative broadly geared towards establishing a unique correspondence between a person and their government record(s) in India with important differences. First, in describing legal fixes, Lynch et al. [11] do not separate legal court rulings from legal statutes in the work of making DNA profiling credible. In Aadhaar’s case, the courts were called upon to adjudicate the constitutional validity of government laws to collect and maintain biometric information on Indian residents. Hence, I differentiated between the work of the courts and the work of the government by addressing them separately as legal and policy fixes respectively. A legal fix is organized through courts, while the government orchestrates a policy fix. Second, Lynch et al. [11] follow the controversy over DNA profiling since its inception in the mid-1980s. I described

not only the immediate history of Aadhaar, but also the colonial and postcolonial histories of antecedent practices of unique identification.

My work of narrating a 20-year history expanded into narrating a 200-year history of antecedent practices oriented to uniquely map a person to their government records in colonial and postcolonial India. The history of Aadhaar in this narrative built on the serially linked array of technical, legal, administrative, and policy fixes devised by the colonial and postcolonial Indian state to uniquely identify residents and described how the design, implementation, and use of Aadhaar produced the need for more fixes. This work allowed me to move beyond a discursive genealogy [6] of the body as a site of intervention in identification practices to narrate the work done by state actors and residents *together* to sustain recognition of residents by the Indian state. On the state's side, I illustrated a complex "knot" [9] of technical, administrative, legal, and policy fixes that have mutually shaped the trajectory of identification practices in India. On the resident's side, I pointed to not only the challenges of aligning with these fixes, but also the efforts to subvert them. These challenges in alignment and efforts at subversion incrementally engender a new serially linked array of fixes and the cycle continues. *The histories of infrastructuring the relation between a technology and its intended purpose narrates how cycles of efforts manifest in partial, yet practical achievement of the purpose before, during, and after the technology's appropriation.*

### **Fostering Historical Research in Studies of Infrastructure**

The study of infrastructures in information science, STS, and allied fields has evolved from the noun-form ("infrastructure") to *verb* ("infrastructuring"), shifting attention away from infrastructures as accomplished objects and towards the consequential processes by which they are achieved, maintained and adapted over time [5,7,12]. When digital technologies layer over

existing work practices, the resulting infrastructure, much like a good stone wall, becomes an uneven arrangement of uncemented things such as technological architecture, discourses, plans, and practical actions that partially overlap with each other [10]. Connecting these partial overlaps is a diversity of sociomaterial practices, which contribute to making an infrastructure the 'invisible background' [17] of distributed work. These practices have their own histories too. As a community of CSCW and HCI scholars that investigate the past to inform the design, critique and conceptualization of digital technologies, our work in writing histories of infrastructuring, I argue, should be oriented towards foregrounding histories of such practices and their implications for ongoing controversies over designing, using, and managing digital technologies.

In this workshop paper, I have outlined one possible approach to writing such histories. This approach engenders a variety of questions and provocations that I hope to discuss further at the workshop:

1. In narrating this history, I have relied mostly on secondary sources and the work of colonial and postcolonial historians of India [e.g., 3,15]. Given that as CSCW and HCI scholars we do not claim expertise as historians, should the work of historicizing digital technologies inevitably involve reliance on historical scholarship already available? What should be our approach when such historical scholarship has not been pursued already? When and where are primary documents in the narration of such histories?
2. Second, opening the focus of historical narrative through infrastructural inversion brings up persistent challenges in making accountable cuts. While it is necessary to acknowledge that historical narratives, thus produced, are partial and situated, how do we overcome the challenges of securing legitimacy of our efforts in outlining what we can learn from the past to inform ongoing practices of infrastructuring digital technologies to achieve their intended purpose?

Finally, from the very beginning, canonical literature in infrastructure studies has raised the question of “when is an infrastructure?” [17:112]. We have answered this question through moments when an infrastructure breaks down and can no longer function as the “invisible background” of distributed work. However, in the context of historical work, the question is no longer focused on moments, rather it is centered on scalar dimensions of time. Paul Edwards, in this regard, has offered a framework where scalar dimensions of time (human, historical, and geophysical) become resources to understand how (and by what means or conditions of possibility) infrastructures are built and how they (do and simultaneously are ‘imagined’ to) endure the passage of time [4]. The history of infrastructuring begins and ends *in medias res* of these scalar dimensions of time. How do we understand and account for the scalar dimension of our historical work and how does it impact the insights that we can eventually offer on the design, implementation, and use of digital technologies?

### Acknowledgements

Support for this research was provided by US National Science Foundation’s Doctoral Dissertation Research Grant #1655753.

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