

Maintainers of Stability: The Labor of China’s Data-Driven Governance and Dynamic Zero-COVID

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ABSTRACT

This paper examines the social, technological, and emotional labor of maintaining China’s data-driven governance broadly, and dynamic zero-COVID management in particular. Drawing on ethnographic research in China, we examine the sociotechnical work of maintenance during the 2022 Shanghai lockdown. This labor included coordinating mass testing, quarantine, and lockdown procedures as well as implementing ad-hoc technological workarounds and managing public sentiments. We demonstrate that, far from being effected from the top down, China’s data-driven governance relies on the circumscribed participation of citizens. During Shanghai’s lockdown, citizens with relevant expertise helped to maintain technological stability by fixing or programming data systems, but also to ensure the ongoing production of “positive feelings” about social stability through data-driven governance. In so doing, such citizens simultaneously enacted an ambivalent and circumscribed form of agency, and maintained social and by extension political stability. This article sheds light on data-driven governance and political processes of maintenance.

CCS CONCEPTS

• **Human-centered computing** → **HCI theory, concepts and models; Empirical studies in HCI.**

KEYWORDS

maintenance, data-driven, data, governance, data work, China, affect, labor, COVID

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1 INTRODUCTION

The CCP (Chinese Communist Party) had positioned itself as a trustworthy custodian of public safety since the beginning of the pandemic. Drawing on the expertise of China’s tech corporations, universities, and state-owned enterprises, the party-state framed a data-driven management approach to COVID as a guarantee of public safety and the key to providing normalcy—something that appeared to be largely absent outside of China, especially during the first year of the pandemic. The provision of public safety via advances in data-driven technology became deeply intertwined with the CCP’s legitimacy [62]. Crucially, President Xi Jinping had made the promise of public safety and the successful maintenance of zero-COVID core to securing a third term as China’s top leader during the fall 2022 party congress [25]. Crucial to the data-driven approach was the implementation of a Health QR code system¹ that tracked people’s whereabouts and close contacts. Via this system, citizens led relatively stable economic and social lives in exchange for having limits imposed on their freedom of movement should they be exposed to COVID, contract the virus themselves, or be in close proximity to an infected person. The system worked well for a while. When many other regions struggled with the continuous rise in COVID-related deaths in 2020 and 2021, China moved within the timespan of only a few months down to zero COVID-related deaths, a status it largely maintained until the new and more contagious variants spread at the end of 2021.

With the spread of new and more transmissible variants of the virus in late 2021 and early 2022, things changed. The Xi’an outbreak at the end of 2021 was one of several incidents that sparked outcries on China’s social media platforms, with citizens documenting the inability to access crucial health services and local mismanagement of the government’s so-called zero COVID strategy. Online imagery and posts of people’s often dramatic experiences were quickly censored, including, for instance, the widely circulated story of a woman whose baby died during childbirth while she was denied entry into a hospital due to the lack of a COVID-test result. Similar incidents abound, stoking continuous anger among the population well beyond Xi’an.

These localized, yet significant outbreaks made it clear that the zero-COVID policy—which committed to “eliminating the virus and preventing a public health crisis at all costs”²—had to be revised. During a press conference in December 2021, Liang Wannian, the head of the Chinese government’s expert panel on COVID, introduced a tweak to the country’s zero-COVID management strategy,

¹The system was implemented nation-wide but regional adaptations and variations used to exist.

²<https://cn.chinadaily.com.cn/a/202204/11/WS625430f0a3101c3ee7acfee.html>

which had been installed shortly after the initial COVID-19 outbreak in Wuhan in 2019. This new policy was referred to as the “dynamic clearing” of COVID or “dynamic zero-COVID,” or as Liang Wannian himself put it, “we currently do not have the ability to prevent all local cases, but we do have the ability and confidence to quickly extinguish an outbreak when cases are discovered.” China’s dynamic clearing policy thus was most fundamentally aimed at both containing local outbreaks with highly localized workforce and managing public sentiments about the isolation and inconvenience caused by lockdowns.

In this paper, we examine the social, technological, and emotional labor that was necessary to maintain China’s data-driven approach as the country transitioned to dynamic zero-COVID, which in turn became crucial for the maintenance of political legitimacy and social stability. We shed light on the sociotechnical work of maintenance during a moment of multi-level breakdown: the 2022 city-wide lockdown of Shanghai, with its technological systems, governance, and provision of daily necessities (such as food and health care services) crumbling all at once. For our analysis, we draw on our long-term ethnographic research on data-driven systems in China as well as a more specific period of ethnographic research conducted before and during the city-wide lockdown in Shanghai between February and June of 2022.

Our contributions are threefold. First, we contribute to ongoing scholarly and public debates on data-driven governance in China. Western media coverage and some HCI scholarship have framed China (the country, its people, and the government) as a dystopian, and all-encompassing “data-driven surveillance society,” a form of “digital totalitarianism” (for example, see [10, 34, 49]). Popular portrayals of China’s data-driven governance often frame the party-state as the omnipotent enforcer of social control, while citizens’ agency and grassroots autonomy tend to be excluded from the examination [8, 47]. Such assumptions neglect the many breakdowns that are common to any technopolitical system of control as well as the labor that data-driven governance necessitates on an ongoing basis. We show that the reliance on the a priori assumption that China constitutes a totalitarian surveillance state as an explanatory frame precludes from understanding how technologically-mediated control in China (as much as anywhere) is not a stable entity, but is actively produced and maintained by various forms of citizen participation.

Second, by foregrounding maintenance labor, we show how political control and stability in China is not always necessarily achieved via top-down, fully automated surveillance systems. We show instead how control and management of citizens was achieved via a form of technologically-mediated governance that demands and, indeed, relies upon citizen labor and participation. Specifically, we examine how the maintenance of technological systems serves the maintenance of emotional stability, and by extension the endurance of political control. By turning to the production and management of feelings, we unveil the iterative process of stabilizing both technological and political infrastructures, crucial during moments of crisis such as the breakdown of China’s zero-COVID management approach. Attending to the role of affect allows us to contribute insights into the way in which political processes can be delegated to the labor of sociotechnical maintenance.

Third, we offer the analytical lens of “circumscribed agency” to contribute insights into the politicization of maintenance work and the labor of data-driven governance. We show that, far from being passive recipients of a technopolitical system of control, the people we met during our research in China simultaneously negotiated and contested the reach of the state. In other words, they demonstrated what we call “circumscribed agency,” that is, they used their technological expertise to cultivate capacities to act and take care of others, despite a pervasive sense of paralysis and limitations imposed on people’s freedoms of movement and thought. These “maintainers” produced, often ambivalently, “positive” feelings of support, care, security, and stability regarding state policies and mandates in moments of social upheaval, via a combination of emotional work and data work. Noticing this form of labor going into maintaining sociotechnical systems of control *and* this form of circumscribed agency is crucial, for it offers theoretical and empirical possibilities for recognizing citizen pushback and negotiation.

2 BACKGROUND: CHINA’S SERVICE-ORIENTED DATA-DRIVEN GOVERNANCE

The Chinese government has framed its data-driven approach to managing COVID as part of a wider “service-oriented government” (服务型政府 *fu wu xing zheng fu*) approach. This particular framing of governance has been in place since 2007, when it was announced at the 17th National Congress of the CCP. Reminiscent of how business-customer relationships are articulated, the new framing placed central emphasis on the “satisfaction of citizens,” stressing their happiness, achievement, and safety as the government’s primary concern. Bureaucrats emphasized a “people-centered” (以人民为中心 *yi ren min wei zhong xin*) philosophy of governance, which was, in turn, framed as a central tenet of the CCP’s commitment to serving the people “wholeheartedly” (全心全意为人民服务 *quan xin quan yi wei ren min fu wu*).

Since the outbreak of the pandemic, the government began to strategically draw from a discourse of crisis management to legitimize a series of new data-driven governance techniques that build on and further expand service-oriented governance. One prominent example is the Health QR Code system, which was introduced in January 2020 after Xi Jinping’s directive that fighting “the people’s war” against COVID necessitated “top-down and bottom-up solidarity against the virus” (全国人民上下齐心、共同抗疫 *quan guo ren min shang xia qi xin, gong tong kang yi*). The color-based health QR code was released as a mobile app in mid-February 2020 by central and provincial governments in partnership with tech giants Alibaba and Tencent.³ The app performs “contact tracing,” meaning it tracks a person’s whereabouts, including location and proximity to others for the purpose of recording exposure to the virus. Based on this data, an individual user receives color codes via the app (see Figure 1, an interface of the Health QR Code for Shanghai, called 随申码 *sui shen ma*), with a green code indicating no exposure to the virus (no physical contact with a contracted person or a location where others had contracted the virus) and the ability to move freely, and the yellow and red codes indicating different degrees

³While often referred to as the health QR code, there are several implementations and versions in use with local governments having pushed province-specific apps.



Figure 1: Interface of Shanghai’s contact tracing app *suishenma* showing the green Health QR code and indicating a negative nucleic acid test result in the past 24 hours

of potential exposure (physical proximity to a contracted patient and/or to virus-hit place). If a user receives a yellow or red code via the app, they are required to self-quarantine for 7 and 14 days respectively.⁴ It is also common to receive (often several) phone calls from local authorities checking that people are following testing and quarantine guidelines. The app is a digital manifestation of the CCP’s service-oriented governance, implemented as a form of data-driven social control, and framed as a mandatory service for the people to guarantee public health and safety [32].

2.1 Grid Management

China’s pre-existing city-wide grid management system came to play a significant role in managing the country’s COVID outbreaks and in containing the virus [41]. Utilizing a system of urban grid management for the purposes of social control is not new in China *per se*, but dates back to 2004.⁵ As a population management system, it divides regions into grids, designating with a designated number of spaces or sites under its jurisdiction, e.g., a particular neighborhood, a street, a university campus, and so on. Grid management makes it possible to oversee and coordinate China’s vast urban and rural sociality by designating regional affairs, organizations and people as belonging to specific grids. In other words, a grid is considered the smallest entity of China’s population management, situated below city-level, district-level, or village-level government offices. Within each grid, designated groups of citizens (often acting as volunteer workers) are responsible for regularly monitoring, collecting, and submitting information (e.g., the details of population size, housing and facilities, social organizations, etc.) to the designated authority (e.g., district-level, city-level, etc.). A concrete example of how the system operates is the “neighborhood committee” (居委会 *ju wei hui*), a grassroots organization (comprised of volunteer workers and members of the party) that manages various affairs of local residents. Neighborhood committees operate at the smallest possible grid of a big city, e.g., a housing compound or

⁴Yellow and red codes can be converted to green after individuals complete quarantine periods with daily check-ins on the app. These regulations have been shifting on an ongoing basis and based on the situation in specific locales.

⁵For a brief review/genealogy of grid management, see [64].

a street [67]. Deemed an important part of China’s national governance innovation by the central government, grid management has been widely adopted and used to maintain public security and social order in both urban and rural communities [26, 47].

During the COVID-19 outbreak, the grid management system functioned as a labor-intensive surveillance system that managed and maintained a variety of data-driven systems, including the health QR code apps, designed to contain the virus at even the smallest grid level. Simply put, when a COVID case or close contact is identified, the corresponding grid is labeled as middle- or high-risk zone, and required to enter a 2-, 7-, or 14-day lockdown, with residents being asked to go either into self- or centralized quarantine and to take nucleic acid tests everyday (often organized and provided for free via their particular neighborhood committee). In this way, the spread of the virus is contained at the grid level, so as to achieve the dynamic zero-COVID [55].

2.2 Shanghai: Data-driven Governance “As Fine As Embroidery”

The grid management system and data-driven systems together constituted a core vehicle for implementing China’s data-driven governance and COVID-19 policy. Shanghai is a particularly compelling case to probe into this particular promise of a precise, efficient, and forward-looking population management system. As one of the biggest and wealthiest Chinese cities, Shanghai has (until recently) been hailed since the outbreak of the pandemic as a particularly successful and well-managed Chinese city precisely given its implementation of data-driven systems built on China’s pre-existing grid management (城市精细化管理 *cheng shi jing xi hua guan li*). Its model of data-driven governance was deemed “as fine as embroidery” by President Xi Jinping himself in 2017. By invoking the often feminized craft of embroidery, state discourse framed data-driven surveillance systems as offering citizens service, warmth, and care (传递城市“温度” *chuan di cheng shi “wen du”*) [56, 57]. And the city was celebrated by state media as delivering the country’s most accurate positioning and tracking of COVID [67]. For instance, in January 2022, the Shanghai government had been able to identify the world’s smallest COVID risk zone, i.e. a small, 20-square-meter milk tea shop.

What made all of this possible was the city’s significant investment in a series of data-driven COVID-related technologies (see Figure 5 and Table 1 in Appendix for details and relations of each system), such as Suishenma (随申码 *sui shen ma*, the Shanghai version of the Health QR Code mentioned above, Nucleic Acid Code (核酸码 *he suan ma*), Venue Code (场所码 *chang suo ma*), and Travel Code (行程码 *xing cheng ma*) as well as a large workforce of volunteer laborers who integrated the data collected by these technologies with the city’s pre-existing grid management system.

The city’s self-proclaimed status as a model of both data-driven governance and COVID management, however, took a major hit when Shanghai’s case numbers began climbing rapidly in February 2022 and the city went into one of the country’s worst lockdowns since the outbreak of the pandemic in 2019. Shanghai’s dynamic zero-COVID management system broke down: the sociotechnical infrastructure of grid management, data tracking, and human labor that integrated both was unable to keep up with the exponential

spread of the virus. For instance, COVID test results were no longer updated in real time and thus QR codes did not reflect immediate exposure. In other instances, people quarantined in the same place received different code colors, confusing on-the-ground workers' efforts to keep up with data verification and correction. With a more contagious variant and cases growing exponentially, the city was no longer able to automatically identify with speed and precision the outbreaks of new clusters. Increasingly, the human labor of manual collection, verification, and updating behind the tracking systems became more crucial than ever, yet increasingly burdened and chaotic. It became impossible to maintain anything close to zero-COVID. Government officials decided to lock down the entire city and its over 20 million residents, ceasing public transportation and prohibiting residents from leaving their neighborhoods and compounds. The lockdown itself, which lasted for 2–3 months for most urban residents, was traumatic for many. Vulnerable populations such as older adults or people with specific needs were cut off from medicine or health care. Migrant workers were locked in often inhumane conditions or forced to sleep outside [60]. Everyone, including urban elites, experienced shortages of food, vital supplies, and access to health services [62].

In this context of breakdown and social turmoil, it became a crucial task for many volunteer workers not only to fix the broken data systems but also to offer emotional support. Volunteer workers began conducting door-to-door examinations and data collection to update the data systems. Yang and colleagues [66] use the phrase “Iron Feet + Big Data” to capture the comprehensive data extraction system that was developed at the neighborhood- and community-level. The system relied heavily on human labor, whether daily patrols, documenting community events or the recording (often by hand) of data ill-captured by sensory technologies such as cameras. It is this work of maintaining social and by extension political stability via emotional and technological tools and labor that we focus on in this paper.

3 RELATED WORK: BREAKDOWN AND MAINTENANCE

We situate this work in and aim to contribute to prior research on maintenance and breakdown—a field of research that spans HCI, Science and Technology Studies (STS), and Computer-Supported Cooperative Work (CSCW) scholarship. This work illustrates how maintenance and repair are crucial to innovation, yet often overlooked and feminized as of low value. Information scholar Steven Jackson, for instance, challenges HCI scholars' obsession with novelty, growth, and innovation, and highlights the work of repair and maintenance. His approach is part of a broader methodological and epistemological commitment to taking system breakdowns, their implications and possibilities, seriously as sites of creativity and knowledge production [29, 61]. Artifacts, infrastructures, and sociotechnical systems often fail to function as designed—and it is in such moments that we notice the processes of articulation, coordination, adaptation, and repair needed for systems to work [33, 45]. Indeed, some have argued that the breakdown of technological systems and infrastructures can provide opportunities for mundane acts of resistance and impetus for action and social change [45, 54, 59].

Breakdowns, in other words, reveal otherwise hidden aspects about the functioning (or malfunctioning) of technological *and* social systems [27, 29]. Jackson calls this the “world-disclosing properties” of breakdowns, which open up moments of “infrastructural inversion” that recenter and renegotiate systems' politics [7]. Breakdowns and uncertainties allow societies to update and reproduce themselves despite constantly unfolding and often precarious conditions [21, 50]. Attending to moments of breakdown, thus, is also a political move, as theorized by feminist technology scholars, to draw out the otherwise hidden relations of power and control [5, 7, 24, 29].

Ongoing discussions about maintenance and repair in HCI highlight the labor of caring and sustaining broken and unstable sociotechnical systems, such as workplace technologies [23, 52], cell-phone repair [27], health care data systems [6], and local networks in the so-called Global South [17, 30]. Scholars of misinformation, for instance, have evidenced how online community members take on the work of fact-checking on a daily basis [46] and in moments of crises [19]. In other cases, the work of improvising and repurposing data (and how they are used) produces the mobilization of feelings and builds community, especially for marginalized people (see [2, 28, 31]). This research shifts HCI's interests away from the dominant binary of design vs. use towards the marginalized or invisible processes, sites, and labor of technology [3, 27, 63]. It has challenged us to rethink what counts as innovation, technological expertise, and agency. We share with this prior research a commitment to attending to social exclusion and forms of value production that are rendered invisible by (the promise of) the smooth functioning of sociotechnical systems.

We build on this research and contribute to HCI's analytical repertoire by interrogating what is produced politically via the work of sociotechnical maintenance. Unpacking this “inversion” of infrastructural repair and maintenance also opens space to problematize the relational positions occupied by caretakers and caregivers. Feminist scholars further remind us to turn to the “dark side” of care in technoscience (in which maintenance's ethos is rooted) [14, 51]. Martin and coauthors complicate care as a strategy deployed as a means of technoscientific governance [44], noting how often maintenance, repair, and care serve to sustain and reinforce the political status quo and system resilience [17, 33, 54]. Indeed, resilience and sustainability have been appropriated by neoliberal governments and capitalist agendas [42] that transfer the “responsibilization” of care to individuals. In an empirical study of China's Health QR Code system in early 2020, sociologist Chungheng Liu [40] revealed that breakdowns and errors of the contact tracing app were common. In order to maintain their legitimacy and functionalities, data-driven systems require users and government workers to perform constant work to “reassemble” its digital infrastructure. As Kim et al. have demonstrated with China and South Korea's COVID data-driven contact tracing apps, the care work of responding to such breakdowns and errors also effects social control [32]. In other words, social control is, counter-intuitively, sustained by the affective and physical labor of care.

Following the footsteps of Sim and Henk who argued that repair and maintenance are at once technical *and* social [24], we interrogate *what does it mean to repair and maintain the social* in a moment of feared social instability. To do so, we center the role of affect and

the management of feelings to examine how moments of hardship are endured and even justified via the work of maintenance. Lu and colleagues show how a state discourse of “positive energy” mediated information-seeking and the spread of misinformation during early COVID outbreaks in China [43]. Joining other media scholars' study of “positive energy” in China [9, 53, 65], they examine how the production of positive feelings by media and grassroots government actors played a crucial role in the state's maintenance of ideological control.

By focusing on the production and management of feelings, we show how control requires maintenance work and normalization [36]. At the same time, we highlight moments of negotiation and micro acts of resistance to the status-quo, for instance during moments of inaccessibility, breakdown, replacement, or reinvention [1]. Drawing from a feminist “standpoint epistemology of maintenance” [29, p.229], we center processes of repair, sustainability, and reproduction of governance and politics: systems of control require active maintenance and thus can be otherwise.

4 METHODS

This paper draws from long-term ethnographic research in China, including fieldwork in Shanghai since the fall of 2021 as well as ongoing engagements with contextual information, including policies, debates, and public documents on data-driven governance and COVID management practices nationwide. Throughout our research, we focus on both the practices and discourses of China's data-driven COVID management systems, their implementation, breakdowns, and maintenance. We pay particular attention to how various actors and parties encounter, perceive, frame, and interact with these systems.

Most of our empirical data presented here is based on auto-ethnographic research conducted by the author 2 when she became a frontline worker during the four-month lockdown of her university campus in Shanghai from March to June 2022. Throughout this period of daily participant observation and auto-ethnographic writing, she gained deep personal and systematic insights into the lived processes of Shanghai's data-driven COVID management, its malfunctions and breakdowns during the lockdown, as well as the roles, practices and experiences of volunteer workers called upon to perform emotional and data work. Her ethnographic observation guided the research team for the subsequent interviews conducted with 17 volunteer workers at the same university. The interviews included questions about personal experiences of volunteering, such as the everyday work responsibilities, challenges, collaborations with colleagues and students as well as volunteers' perceived roles and experiences of data-driven technologies in supporting their management work. Throughout these two ethnographic engagements, and with the permission of our interlocutors, we collected empirical data on the technology surveillance and data tools, including what was shared via mobile apps, online documents, sheets, and other materials, that were part of the daily infrastructure managing the lockdown. Based on her extensive diaries, author 2 wrote up fieldwork memos, detailing early themes that emerged from the data.

Together, the three authors coded and wrote up ethnographic vignettes, paired with weekly Zoom discussions, analysis, and interpretations over the timespan of five months. We collaborated to iteratively revisit and refine our interpretations and analyses. During this five-month phase of co-analysis and co-writing, key themes emerged such as the grid management labor and the political work of maintaining stability. These themes led us to conduct online and archival research on the history of the grid management in Shanghai as well as policy shifts with regards to urban population management over the last 10–20 years. As universities did not function as a single grid unit for self-governance before the pandemic, we discovered that this mutation and downsizing of the grid unit management structure has been a recent phenomenon resulting from dynamic zero-COVID politics.

For our analysis, we have conducted close, critical reading of Chinese policies, government documents, and the broader societal debates as they have unfolded in relation to and through our research sites [11, 12]. As defined by feminist scholar Adele Clarke, this form of situational analysis understands discourse analysis not to occur above or outside of practice, but as unfolding alongside it. While not always explicitly quoted or referenced, then, the analysis of public debate and political discourse informs our broader theorizations on societal and political shifts and the role technologies and technological work in particular played in these transformations. This approach allowed us to pay close attention to the ways in which the CCP's construal of data-driven governance as a project of providing “service,” “safety,” and “security” for the people enacted a particular form of paternalistic state control via the promise of data and technological efficiency.

5 FINDINGS

5.1 Becoming a Volunteer Worker

On March 13, 2022, Shanghai's number of active COVID cases had risen from one on March 1 to 41, and the number of the asymptomatic cases reached 128—a first in Shanghai since the outbreak of the pandemic two years earlier. On the same day, the Shanghai Municipal Education Commission announced that all universities in Shanghai would transition to so-called lockdown management (封闭管理 *feng bi guan li*). Shortly after the official announcement, students at X University (anonymized) could still move freely on campus but were no longer allowed to leave it, and faculty and staff were asked to return home before 1pm the same day. The university issued a letter calling for volunteers to remain on campus and support students as they transitioned into lockdown. Many of the faculty and instructors, myself (author 2) included, stepped up as volunteer workers. Most of us thought this volunteer work would involve a couple of days of work, helping students get tested and acquire food, while we stayed overnight in our own office spaces—a task that seemed contained and easy to carry out.

About a week later, on March 27, 2022, the number of asymptomatic COVID cases went up to 4381. At about 8:30 pm that day, the Shanghai government announced a two-phase lockdown of the city, with the eastern Pudong districts locked down from March 28 to April 1, and the Western part of the city (Puxi) locked down from April 1 to 5. Across social media and personal conversations, the atmosphere was nervous, but people mostly remained optimistic

that Shanghai's previously successful COVID management would be re-established. Residents spent the next few days purchasing groceries to last for a week or so and then transitioned into home quarantines, with local neighborhood committees managing daily nucleic acid tests. Yet the numbers of COVID and asymptomatic cases continued to increase dramatically. Through April 5, the daily numbers rose by nearly 20,000 each day. Consequently, the city government of Shanghai did not lift the lockdown after one or two weeks as was originally suggested. In the weeks that followed, many Shanghai residents experienced dramatic shortages of food and other necessities and were confronted with the emotional turmoil of uncertainty over when the lockdown would be lifted.

The often traumatic experiences of city residents in general were mirrored at a smaller scale on our university campus. As the city transitioned into its full lockdown, our volunteer work transformed drastically. Students were no longer allowed to leave their dormitories, and so I became one out of five instructors to manage daily food and water order and delivery as well as daily COVID testing in our department's building and associated dormitories (a 38-story building, with nearly 1300 student residents). The workload was compounded one day into the official lockdown when a COVID case—the first on campus—was found in our own building.

I still remember vividly the first few days of the lockdown. The four other volunteers and I were asked to wear hazmat suits daily from 6 am to 1 am, a claustrophobic experience that generated its own visceral trauma. Our days were filled with the never-ending tasks of delivering food, water, and disinfectant materials to nearly 1300 students dorm by dorm, organizing COVID tests, and dealing with an array of emergencies that we could barely count. We worked without a break, but still struggled to manage students' basic living needs, often pushing dinner after 9 pm. Because the transition into lockdown occurred so suddenly, we initially lacked basic living supplies for students; drinking water, for example, was limited to 500 milliliters per student for two days. We lobbied for additional volunteer support and resource supplies from the university but did not receive these until a week into the lockdown.

What neither I nor my fellow volunteers could have foreseen at the start of the lockdown was that we would spend the following three months sleeping, living, and working alongside the students in the same building. We would be responsible for not only the procurement of basic necessities such as food and water, and the enabling of mass testing on campus and COVID-case tracking, but also the management of students' and colleagues' emotional distress and turmoil. The latter were intensified when it became increasingly clear that the city's data-driven approach to managing COVID was no longer delivering the "precision" and "people-centered-ness" that it promised. Some of my colleagues joked that far from being an exemplar of Shanghai's "smart transformation" (智能化 *zhi neng hua*), the campus was thrown into a much more labor-intensive stage of technology development, akin to the 1990s' information society. Indeed, the lockdown suddenly made visible to many of us that the promise of a data-driven COVID management approach and zero-COVID itself had been a far cry from reality even prior to the lockdown. The breakdown made visible how both systems had long relied on the volunteer labor of community workers. As a colleague in computer science aptly put it, Shanghai's data-driven COVID

management was 花架子 (*hua jia zi*)—something that sounds good in theory, but lacks substance.

5.2 Data Work: Maintaining the Promise of a Precise Data-Driven System

One of the fundamental promises attached to Shanghai's data-driven COVID management was its precise, real-time contact tracing and tracking, including the early identification of clusters. The system was promoted as capturing and updating information automatically and in real time, including data on people's location, test results, and close contacts, down to the smallest grid level. The Shanghai lockdown, however, made it suddenly clear that this level of "precision" had never been achieved automatically, but required extensive situated data work on the ground, with volunteer workers collecting, recording, and making sense of data. When I became a volunteer worker at the university, my colleagues and I discovered that the pre-existing data management had been static and often fragmented. As Jian, my colleague, described it to me:

We have the basic statistical data, but this static data is useless for pandemic prevention. We need real-time population data, which is hard to be collected or self-reported. For example, my mother comes to my home and helps us care for my child. It is very normal. We are unlikely to report this data to the neighborhood committee in real time, although we are required to do that. Very few people do that. I think this phenomenon is very common, not only in our community.

It had become apparent, in other words, how much a data-driven COVID management approach relied upon volunteer workers behind the scenes performing daily data work such as data collection, recording, correction, updating, meshing, and reconciling in order to build and maintain the necessary data infrastructures. This kind of data work was meant to support a bottom-up grid management on our campus. One key task was to build—by hand and as precisely as possible—a data infrastructure for each respective grid (e.g., a campus building, a floor) and then submit the respective data to our university's upper management. We collected and recorded data such as numbers of students and staff, their demographic information as well as student data (dorm, major, school, head teacher, secretary of the school), dietary needs, data on students' and staff's status of testing and test results, and more. We collected and then recorded these data via several digital management systems provided by the university. The Chinese social media and messaging app WeChat constituted the main (and often the only) tool to connect various COVID-related management systems (grid management, student data) into a cohesive whole and supported the communication and collaboration across different units on campus. Our day-to-day work as volunteer workers thus entailed spending hours in WeChat, managing countless WeChat groups.

We used both digital and physical modes of data collection. The technology-mediated collection was meant to crowdsource data, with students having to provide the data we fed into the various systems. A central tool in this process was the WeChat functionality "Group Note" (in Chinese referred to as 接龙 *jie long*), which enables participants to relay information in a group chat like a chain or

thread of replies. The other commonly used tool was “shared document” to share information broadly. We would set up a new thread, for instance, and each person in the associated WeChat group would relay it to report their own respective situation. Similarly, we created a shared document in Tencent Doc and Kingsoft Doc (two popular Chinese counterparts of Google Doc), and asked people to provide various data such as number of students on each floor, their dietary needs, etc. Functionally, the WeChat “Group Note” was mainly used to collect real-time data (e.g., students’ and staff’s nucleic acid test results and antigen detection test results within 24 hours), while the Shared Docs were mainly used to perform basic statistical analysis (e.g., number of students in each dorm). In addition, we also designed our own technological tools to collect data. For instance, in order to create a localized, campus-specific version of a real-time nucleic acid test situation, we designed a university-specific QR code system to check people’s nucleic acid test results (签到码 *qian dao ma*). Just as had been the case outside the campus and before the lockdown, students were required to scan this QR code to upload their testing data.

Crucial for this management of students and staff was a process of self-reporting (报数 *bao shu*) via WeChat. Self-reporting meant, for instance, that students and faculty had to disclose positive test results, a requirement that was contrary to their personal interests and risked centralized quarantine. In order to avoid “inaccurate” self-reporting, we were asked to manually screen each dorm (扫楼 *sao lou*), calling students one by one. Jiao, a student volunteer, described this process:

I really want to swear at WeChat Group Note/jielong. The jielong number of our grid was always wrong. Because there are a few senior Ph.D. students in our grid, their daily routines were different from ours. They usually get up in the afternoon and miss the morning test and jielong. So I need to call them to test and jielong. But it's so hard to reach them, even harder than reaching the sky.

Issues like these became pervasive, making daily verification of self-reported data one of our main tasks. Put simply, we had to maintain by hand a technological surveillance system that had broken down entirely.

The same was true for mass testing. The university required us to perform mass COVID testing twice a day. One of our tasks as volunteer workers was to ensure that each student in our grid was tested “on time” each day. After students completed a COVID test, they were asked to a) self-report the result in their assigned WeChat groups and b) scan their respective QR codes/qiandaoma on site, then the qiandaoma data would be uploaded to the university’s management system automatically. After all students tied to a particular grid completed their tests, two additional “checks” were performed synchronously (see Figure 2, which shows how test data is flowed from students to frontline management workers and systems within the university grid). First, we compared by hand the results self-reported via WeChat and via the QR code scan, respectively. If the results were inconsistent, we had to search for the assumed missing or incorrect data. We then submitted the final and “correct” number to the school secretary in charge of nucleic acid testing work. Second, the university management system digitally

compared test results submitted by students by hand and via the QR scan. If these results were inconsistent, we were required once again to check and correct for inconsistencies.

Verifying consistency across these data sets was part of a continued drive towards a zero-COVID status on campus, even if just in appearance. Inconsistencies, however, arose on a daily basis for various reasons. For instance, a student might have simply forgotten to scan the QR code or scanned the wrong QR code, or the student records in the management system were not updated in time, and so on. One of our key tasks and what occupied us for many hours each day was thus identifying and correcting errors in an effort to re-establish the status and image of a COVID-free campus.

The normative coding of these requirements and the affective labor entailed in trying to meet them was brought home to me one day when we received a note from the campus hospital that, at the end of the day, there had been 6 inconsistent recordings in the system. We were asked by hospital staff and administrators to identify the “culprits,” a term that not so subtly implied that such inconsistencies could only be attributed to students or staff breaking the campus rules of lockdown, or to our own faulty data collection. After hours of checking across spreadsheets and WeChat groups, we discovered that the 6 “inconsistencies” were due to 6 students who lived and worked on a different campus altogether, but had mistakenly scanned the wrong (our campus’) QR code.

These various incidents of breakdown made visible the extent to which human labor had always been necessary to maintain Shanghai’s data-driven COVID management. Even people well-acquainted with the technologies and systems involved found themselves reassessing their understandings. Qin, the project manager of Shanghai’s data-driven epidemiological investigation system, explained how the lockdown changed her own perception of Shanghai’s data-driven governance: “There is no so-called data-drivenness,” she said,

*[... it] is fully human-driven, it is very traditional. There is human labor which we refer to as liudiaoyuan (流调员 *liu diao yuan*). [It means] when a positive COVID case is identified, liudiaoyuan needs to trace the [person’s] recent 14-day travel histories and close contacts, and then notifies these close contacts. This data is added into the data-driven management system by the liudiaoyuan as well, manually. I was very shocked when I learned about this process in the beginning. I couldn’t believe this was Shanghai, an international metropolis.*

Yet despite such reassessments and first-hand experience with the extreme overwork and exhaustion brought about by maintaining and managing the data systems, many of my fellow volunteer workers told me that they still considered a data-driven COVID management approach to be the future and the appropriate direction for Shanghai’s government to take in the long run, even after the pandemic. As Bin, a senior leader in a state-owned technology enterprise who worked closely with the Computer Science department on our campus, and a community frontline volunteer during the lockdown, told us, “We now know that complex, advanced systems, with this or that function, are useless. Data—real-time, accurate, safe and connected data, is the way to go.” Indeed, one might argue that most salient accomplishment of these data workers was thus

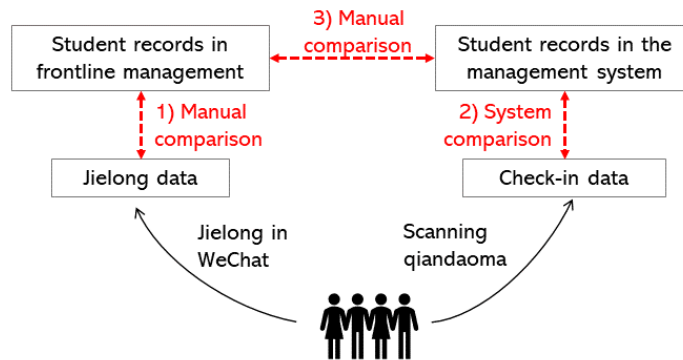


Figure 2: A diagram of the data flowing from students’ self-reporting and self-scanning to management systems for manual or automatic verification in the university grid

the maintenance of belief in a data-driven future. They maintained, in other words, the promise of a precise data-driven city management system, for Shanghai and beyond, despite the breakdowns and a widening societal critique of the government’s approach to COVID management.

5.3 Articulation Work via Data Work: Maintaining the Promise of a Well-Managed Campus

On March 27, 2022, after the Shanghai government announced the city’s two-phase lockdown, the university’s “pandemic prevention working group” began building a digital grid architecture and mapped the university’s original organizational structure into a grid management hierarchy (see Figure 3). Faculty, staff and students were assigned to a specific grid. At the same time, the university’s original organizational hierarchy (schools, departments) remained in place. Each student was managed under both their original organizational hierarchy (e.g., school and department) and a grid management hierarchy (e.g., segments and buildings). A key task of our volunteer labor, beyond managing the data systems mentioned above, also became the articulation and communication between these two hierarchies (referred to as *tiao-kuai* in Chinese) in order to manage the lockdown. And the articulation and communication work were largely shaped and centered around data work and data systems.

The facilitation and coordination between different structures of population management was one of the biggest challenges of China’s pandemic management system writ large. On the city-level, the interaction between different hierarchies of social management was performed by mid-level government officials. A vast workforce of volunteers labored for these officials to collect, record, and submit data as well as identify and report problems. At the university-level, volunteer workers were responsible not only for the frontline management of their respective grids (e.g., a building), but also for the collection and provision of data on behalf of the larger grid management system at the university-level. This work included frequent communication between the organizational structures of *tiao* and *kuai* to further facilitate information flow across all levels of management.

Since the volunteer workers assigned to physical segments (e.g., a building) had the most comprehensive view of the actual situation, they took on the role of “articulators” on behalf of various grid units of both *tiao* and *kuai* hierarchies. This work entailed streamlining, via phone calls and WeChat messages, between the different management structures. And it entailed making sense of various data on campus residents. Without a commonly shared platform for storage and access, this data was highly fragmented, dispersed across different places and platforms, e.g., the university’s digital COVID platform and the school’s COVID platform, with data held across different parties, e.g., class teachers, monitors, etc.

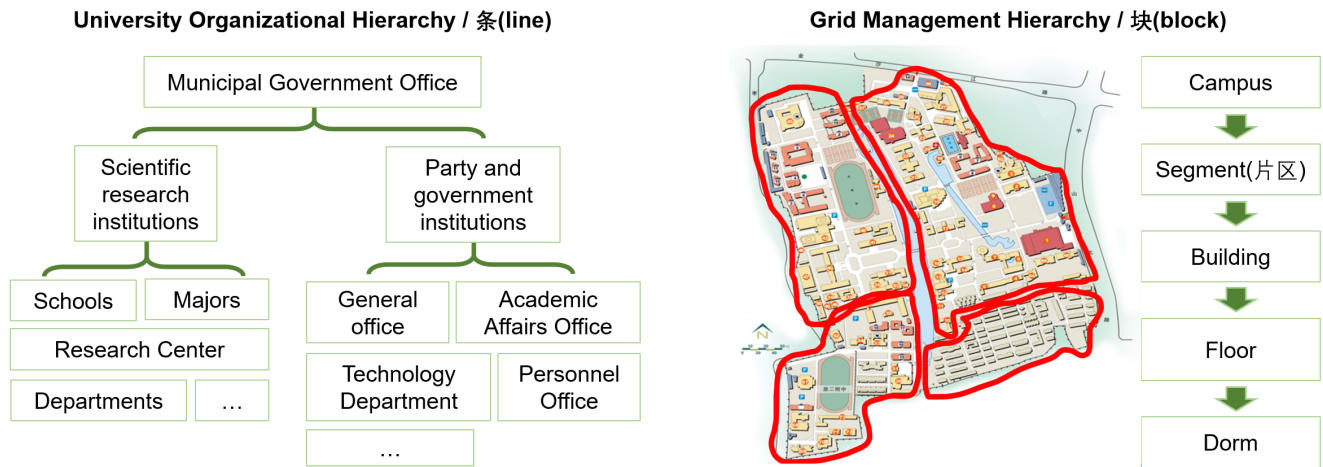


Figure 3: A diagram of the dual university grid management structure and hierarchy, showing the university organizational hierarchy as “line” (条 *tiao*) and the grid management hierarchy as “block” (块 *kuai*).

Jin, the manager of our particular grid questioned the efficacy of this process:

I feel the biggest problem is how to connect different data parts. Currently, we repeatedly seek, collect, record, and exchange data every day. Sometimes, different level management units need the same data, and then we provide these data to different people over and over. I know this is evitable, but it is really a huge waste of resources and time. This concerned me very deeply. Why couldn't we put this data in a public place or a public platform? Or, either top-down or down-top, instead of the current mixed ways.

While different stakeholders required different data to reach their own goals, volunteer workers took it upon themselves to identify and connect data. Every day, for instance, we collected and updated students’ dietary data (the number of normal boxed meals, halal meals, or vegetarian meals, and the number of breakfast, lunch and dinner, etc.) and transferred them to the dining hall; and recorded students’ and staff’s nucleic acid test and antigen detection data and transferred them to the campus hospital. Volunteers increasingly understood that their job, perhaps most importantly, was to maintain the veneer of a data-driven management system, with much data gathering and collecting revolving around correcting system errors, and recording the same data over and over and across several platforms to satisfy the university mid-level management’s aspirations to maintain a data-driven and dynamic approach to zero-COVID.

To create some form of meaning in this rather pointless process, our team began working on a user-friendly interface to inform students of important announcements and help them deal with information and data overload. We streamlined various data points into one aggregated whole (see Figure 4-a), which was released daily at 9 pm, making data not only available to the students, but also offering high-level interpretation and meaning-making. The volunteer workers paired dull, logistical information with fun and

playful emojis, memes, and stickers, providing a sense of warmth and “positive feeling” (see Figure 4-b and 4-c). The undergraduate student who designed the pictured meal tickets explained their motivation:

Us students have been eating box lunches for a long time. Many students were very Negative about that and complained a lot. I can't change this situation, but I hope to do something to make it better. So I designed these meal tickets. I hope to bring a little bit of ease and smile to them, and make the hard time a little better.

In a similar vein, several faculty and students with technological expertise volunteered their skills to aid the campus-wide COVID management and create feelings of stability and order. For instance, Jian, a professor of computer science, designed a Microsoft Office-based automatic statistical tool that captured and automatically uploaded information students submitted via the WeChat groups (mentioned in 5.1). He talked with great pride about designing the system:

In the beginning, I found that the work I needed to do was too messy. Most of my time was spent on repetitive data work, counting numbers from Group Note in different WeChat groups, catching up with WeChat messages, inputting data into excel, checking the consistency, etc. This work was very cumbersome, time-consuming, and made me dizzy. So I designed this tool. It simplified the process and automated the repetitive work. My tool helps improve the efficiency tremendously while also avoiding many manually-caused errors.

This simple but useful tool quickly became popular across campus and was adopted by other volunteers. Following Jian’s footsteps, other students and faculty developed a variety of technological workarounds to help frontline management. Min, the dean of the School of Computer Science, who had become the manager of the volunteer group who took care of food delivery, wrote a distribution and planning algorithm. He explained that the goal was “how

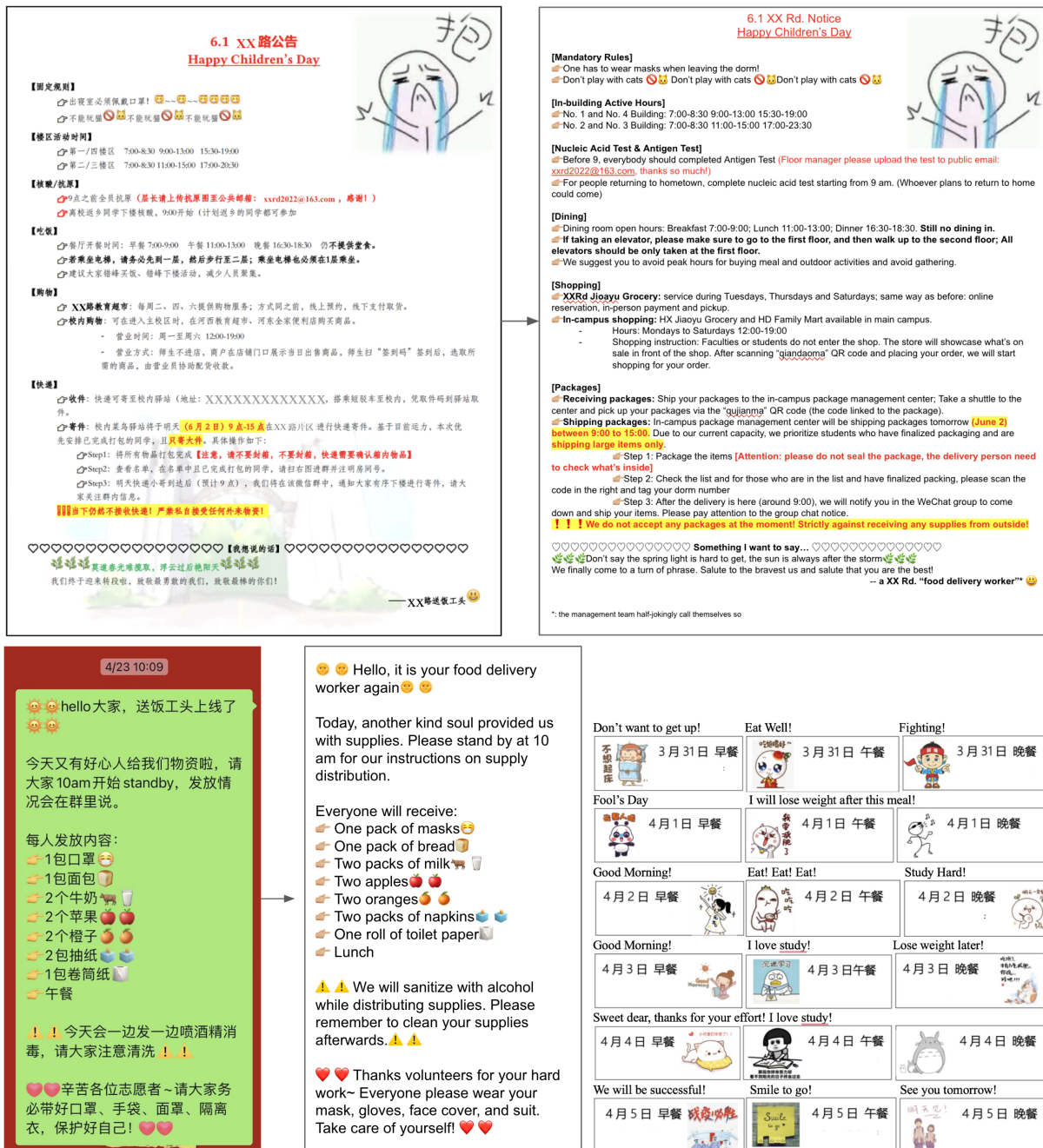


Figure 4: a) Up: a BYL announcement in June, in which all information was streamlined and put in order with key points highlighted. b) Bottom-left: a message Meng sent to students in which he added emojis to parse the information and make them feel more “positive.” c) Bottom-right: Meal tickets designed by student volunteers with cute stickers and warm notes.

to make the most of limited resources, use minimal cost and the fastest way to deliver food to students, and let them eat the hot meal.” His algorithm significantly improved food delivery efficiency and reduced errors. Solving such problems for students and frontline management, he told me, gave him a sense of achievement

and made him feel useful. One day, after finishing the food delivering task, he posted the following message in the WeChat group comprised of volunteer workers:

Today our group fully optimized the path and only used half an hour to finish the delivering of 1132 lunches for

11 buildings. We do whatever we can do (“有一点光，就发一点热” you yi dian guang, jiu fa yi dian re), but don't do it recklessly. We emphasized efficiency and optimization. This is the spirit of our CSers.

The more literal meaning of the Chinese phrase “有一点光，就发一点热” mentioned here is significant in that it reveals a broader sentiment of providing a feeling of warmth and care during an increasingly brutal experience: “as long as we have some light (just like candles), we shall continue spreading heat/warmth.” While technological inventions like Jian's were simple, relying on basic tools such as Microsoft Excel and shared documents, they sought to enable positive feelings about the situation. Jian and others told us that their technological intervention was not about the advancement of data, but about cultivating an attitude of problem-solving, i.e., the feeling that broken systems can and should be fixed by citizens, or in Jian's words:

I don't think what I have designed is a big contribution. These tools were mainly for ourselves, and for reducing our own workload. We just want to take care of the university and our students, and don't cause trouble to the government (不给政府添麻烦 bu gei zheng fu tian ma fan).

Most volunteer workers, including myself, did not identify with the state discourse of performing a heroic task or historic mission. The work was much more mundane. It involved making do and providing a sense of relief for the students, or as Min put it, fostering a sense that we could “do something during this difficult time.”

5.4 Emotional Work: Managing Feelings and Maintaining Positive Energy

As volunteer workers became more experienced and technologically adept at supporting management problems, more thorny issues arose. In the first half of the lockdown in April, Shanghai experienced a dramatic shortage of food and other daily necessities. The supplies our university obtained often failed to meet the needs of students and the government's promise to deliver “one item per person.” Thus the challenge of how to distribute limited supplies in a fair manner to students as well as managing their worries and frustrations over the lack of supplies became a central task for volunteer workers. The emotional intensity engendered by this food scarcity was made starkly clear when a group of Masters' students fought in one of the university's WeChat groups for several days over the distribution of a single bag of chips. Scenes like these abounded, with volunteer workers attempting to bridge distressed students and an increasingly desperate university management.

Further into the lockdown, many of us felt acutely that our patience was stretched thin, and that we had reached our limits both mentally and emotionally—a sentiment that was also expressed by city residents in general. Stories about suicides and various traumatic experiences of people put in centralized quarantine made their rounds on social media (but were often quickly censored). Uncertainty over when the lockdown would end made the situation feel unbearable, with many people commenting that the city had broken down not just infrastructurally, but in terms of the rational and scientific approach to management that it had claimed to

have mastered. Volunteer workers were deeply exhausted from the laborious management and emotional work, with students struggling as they were confined to their rooms, frustrated, panicked, and anxious. Bo, the leader of one segment and one of the senior managers at the university, offered advice from his own experience trying to regain students' trust:

Many students sent messages to me, especially the students of our School (of Engineering). They know “he is here” and might feel a bit more reassured. Some feelings like “we are not alone” or “our leadership is also staying with us and could help them anytime” are important. Some of the students might feel it is useless to share their issues to their faculties, because faculties are less resourceful or powerful, so they talk to me. It is a kind of trust. I must be responsive and present for them, no matter how busy I am.

Jin, one of the volunteers, also tried to add a personal touch to the text messages that students were bombarded with, and that they described experiencing as “cold” and “emotionless” orders:

I never liked using texts to notify students before. Currently, we have no choice, WeChat seems like the most convenient way. But when I send a text notification through WeChat, I always follow up with a kind voice message. The text messages were really void of any emotions. If we don't follow up with our own voices and provide a sense of affection for the students, it will sound very cold for students.

At the same time, a group of student volunteers established a public shared document that encouraged students to share their personal feelings and difficulties, ranging from living conditions to mental well-being. The document also offered mutual support. The tool was quickly disseminated around campus. We saw requests for help and testimonials of shared difficulties flood in, as did the offerings of peer support. Faculty volunteer workers also turned to the mutual care tool to provide support and backup. The tool eventually drew the attention of the upper management at the university and received further support to improve its UI and accessibility. Apparently, university leadership, like the volunteers themselves, had come to recognize that a central task of the latter was not only maintaining and supplementing technological work, but performing the affective work of maintaining the mental health and well-being of the on-campus community, creating feelings of “positive energy” (正能量 *zheng neng liang*) [9, 53] about a far from positive situation.

6 DISCUSSION

6.1 Technopolitical Maintenance of Stability

We have examined the sociotechnical work of maintaining stability and the promise of data-driven COVID management during the 2022 Shanghai lockdown. This work included the emotional labor of providing care during a time of intense personal and collective turmoil through the work of data gathering and recording, mass testing, managing quarantine, and implementing ad-hoc technological workarounds. *What can we notice differently if we turn towards*

the technopolitical work of maintenance? Why is it important to attend to the production of feelings in China's data-driven governance processes? Drawing from critical commitments to the study of care in feminist STS and HCI [13, 38, 44, 48], we have shown that turning towards the labor of maintaining social and by extension political stability is key to understanding how China's data-driven governance and an associated intensification of societal control operate on a daily basis. Rather than constituting always necessarily an automated top-down force, data-driven governance relies on selective citizen participation and the outsourcing of both technological and emotional labor to specific groups of the population.

This maintenance work enabled the mediation and management of public feelings. Emotional distress triggered by the lockdown and frustrations with the breakdown and mismanagement of COVID controls coincided with a growing suspicion, on campus and across the city more broadly, that Shanghai's promise of data-driven governance was a far cry from reality. It was at this moment that the maintenance of a sense of social and technological stability became key to the management of a locked-down university. The digital platform WeChat became a tool through which to provide emotional support and spread "positive energy" on behalf of the university and, by extension, of the government itself. Creating ad-hoc technological workarounds produced social and emotional stability by smoothing over glitches and creating (temporary) feelings of a well-managed lockdown as well as of care and support.

Put differently, maintenance labor (which included both technological and emotional work) further stabilized and normalized a data-driven approach to governance and a mindset of technosolutionism [32]. The maintenance of social stability was made actionable via technological affordances and expertise—by programming a feature and improvements into existing tools or by updating and improving data infrastructure to approximate the promise of "real-time" data-driven governance. Our interlocutors aspired to achieve a sense of full automation with AI and facial recognition. It was these aspirations that normalized the work of maintenance as a necessary step in the process towards consolidating better, smarter data infrastructures. And it was their maintenance work that upheld the promise of a future of smooth data-driven governance and by extension political stability.

6.2 Attending to Ambivalence in Circumscribed Agency

Seeing sociotechnical practices in China's COVID management as maintenance shows a glimpse into the "relational interdependence" [38, p.5] between the state and citizens. This paper zooms in on the ways in which the Chinese state is in fact dependent on various forms of citizen participation to maintain stability. And we show how such political participation is reserved for and delegated to those holding technological expertise. With these insights we aim to open up the analysis of maintenance, to include its politicization as well as feelings of ambivalence amongst those enrolled to participate in the production of societal and political stability.

The volunteer workers we followed in this research carried a particular form of technological expertise, which provided them with what we call "circumscribed agency" to perform the maintainer's role. Their technological know-how gave them the sense that they

could do something, that they *could* act, despite the harsh restrictions and limitations imposed on their freedoms of movement and thought. While most Shanghai residents expressed deep frustration at the removal of basic personal rights (e.g., procurement of food, freedom to move about, freedom to express one's opinion), the workers in our study experienced the lockdown—while deeply emotionally and physically exhausting—as a moment to act upon their skills, positions, and resources. Recall Min's statement after he solved the algorithmic problem in managing deliveries that the tasked enabled him to feel "useful." While political agency was mostly prohibited, technological work became a site to act and provide care—a form of agency that was denied to most other people in Shanghai at the time.

As feminist urban scholar Shannon Mattern reminds us, there is a risk of romanticizing maintenance work as emerging from a place of innocence or subaltern subjectivity [45]. Drawing on feminist sensibilities [14, 16, 20, 44, 51], we attend to how care and control, service and surveillance can co-exist, producing a subjectivity of ambivalence that we found to be located in maintainers' "circumscribed agency." The maintainers of stability described in this paper are highly-educated members of society, employed at a well-known public university. Many of them have technological literacy and some of them previously held important administrative positions with powerful connections and resources. They held a vital, and to-some-extent hypervisible position, interfacing between the state's promised service-oriented data-driven government and the citizenry, which was collectively treated by the state in many ways like children in need of supervision [18, 35]. These workers' access to social, political, and technological resources put them in a position of a "state proxy" [47] acting on behalf of the state and of their fellow citizens [58].

They articulated feelings of ambivalence to make sense of this impossible role caught between the state, understood as increasingly controlling and irrational, and a citizenry becoming increasingly angry and dissatisfied with the state. Many of the volunteer workers critiqued the city-wide technological breakdown and mismanagement of COVID, yet yearned nonetheless to rebuild and improve it. They took it upon themselves to provide workarounds for the broken COVID management systems, motivated by their strong belief that technological fixes can also provide social fixes. But their interventions, while improving the immediate living and working conditions of people around them, also enabled the endurance of control itself. Limited by the zero-COVID constraints of supplies and resources, our interlocutors' reasoning about their technical achievements reveals the emotional labor effected through technological tinkering and affordances such as adding small features to a text message or inventing a sharing system for students' well-being.

As we have shown in this paper, many of these maintainers felt thus highly ambivalent about their own role in maintaining stability on behalf of the state. We argue that noticing these feelings of ambivalence is crucial for it demonstrates both the reach and the limits of technologically-mediated state control and power, which simultaneously recruits and limits participation by the people. In line with ongoing efforts to debunk ideologies of usefulness, development, sustainability, and scale accompanying techno-optimism [4, 15, 36], we argue for the importance of thinking with ambivalence to approach technologically mediated and data-driven governance [37].

Centering feelings of ambivalence, in particular, allows us to move beyond masculinist frameworks of individual empowerment by pointing to partially compromised acts of resistance and what we have called circumscribed agency.

With the analytical lens of circumscribed agency, we contribute to ongoing efforts in HCI that push back against simple binaries and universal boundaries of the state vs. citizen, control vs. participation, top-down vs. bottom-up [22, 37, 39]. We have shown that control, even in a tightly managed system like the Shanghai lockdown, depends on selective participation on the ground. While some citizens are tightly controlled, others are given (often indirect) permission to enact a tightly circumscribed agency. This circumscribed agency offers, nevertheless, a crack in the seemingly smooth operations of state control, as the recent wave of protests in Shanghai (and many other Chinese cities) has made visible. And it invites us to challenge any simplistic interpretation of an all-seeing state and a passive, fully-controlled citizenry.

7 CONCLUSION

In this paper, we have offered the analytical lens of “circumscribed agency” to account for the ways in which Shanghai residents have simultaneously sustained and contested the intense controls imposed on people during a city-wide lockdown in the spring of 2022. We have argued that attending to this circumscribed agency opens up our understanding of state surveillance and control by including in our analysis processes of politicized maintenance as well as participatory and affective governance.

As we are working on the final edits of this paper, protests have erupted across various cities in China and abroad. The protests began peacefully, centered around vigils to commemorate the deaths of ten people in a fire that broke out on November 24, 2022, in a locked-down apartment building in Urumqi, Xinjiang—a region that has experienced some of China's harshest COVID restrictions (including a lockdown that has been ongoing for over 100 days). Many agreed that the deaths could have been prevented had the COVID-related lockdown measures not hindered firefighters from entering the affected area. Over time, the protests expanded in their messaging beyond expressions of peaceful mourning of the deaths in Urumqi, with some explicitly critiquing the lockdown and the party-state.

As of December 13th, 2022, China announced an end to the nationwide Travel Code and Health QR Code service, as the government suddenly implemented a loosening of its “zero-COVID” policy. Under the new measures, public places and cross-regional travel will no longer require nucleic acid test results and the display of a green Health QR Code. It remains unclear how (and if) these protests played a role in the government's measures to loosen its drastic zero-COVID management controls. Instead, we might turn to the ways in which both the data-driven governance practices and the maintenance labor they necessitate live on despite the end of the zero-COVID policy. The circumscribed agency we have described in this paper constitutes an ongoing, ambivalent site of action for citizens as they simultaneously contest and participate in the tightening of a technopolitical system of control in the name of societal security and stability. These forms of circumscribed agency

are what make China's contemporary technologically-mediate governance work (via various forms of citizen participation) — a mode of governance that is so often ignored by frames that take the assumption of an all-encompassing state surveillance as a starting point and explanatory frame of analysis.

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**A A LIST OF THE DATA-DRIVEN COVID
MANAGEMENT SYSTEMS IN SHANGHAI**

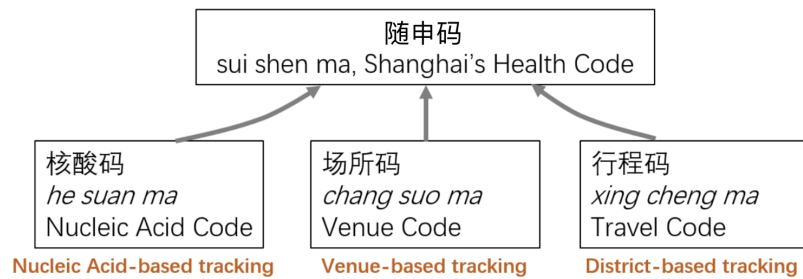


Figure 5: Relationships between each code system

System	Function	Purpose
健康码 Health QR Code	Released in February, 2020 first in Hangzhou, then nationwide, the Health QR Code is a contact-tracing system and generates green-yellow-red code to indicate individual citizen's "risk level." Red means 14-day quarantine, yellow means 7-day quarantine, and green means free-to-go.	It is co-developed by China's big tech companies such as Alibaba and Tencent, and municipal governments. It was invented to tackle the re-opening after the initial lockdown in China in 2020.
随申码 <i>sui shen ma</i>	Released February 13, 2020 in Shanghai, <i>sui shen ma</i> functions as a citizen's digital identity. It generates green-yellow-red code by integrating and computing personal information, including personal Nucleic Acid result, close contacts, and travel history.	It is one of Shanghai government's most important tools for precise, data-driven COVID management.
核酸码 <i>he suan ma</i> , Nucleic Acid Code	Released April 8th, 2022 in Shanghai, Nucleic Acid Code functions also like a digital identity and scans to identify one's nucleic acid result. It is not a color-code system, only to scan while one does the nucleic acid test.	Can serve as an offline certificate to record people's nucleic acid test results within 30 days. It was established to address the network congestion issue <i>sui she ma</i> suffered at the beginning of Shanghai lockdown (embedded in the same app as <i>sui shen ma</i>).
场所码 <i>chang suo ma</i> , Venue Code	Released in 2022 nationwide, Venue code is for people to scan (via WeChat or Alipay) upon entering public spaces such as malls, supermarkets, office building complexes, public transportation stations, and more. Each venue has its specific code for registration and recording.	Verifies one's trajectory and entry and exit histories into and out of public spaces, hence potential close contact with cases, and supports venue-based tracking. Venue Code records more precise flows of people.
行程码 <i>xing cheng ma</i> , Travel Code	Released in 2020 nationwide, Travel Code can track one's travel histories with cellphone data within the past 7 days.	Can be used to verify one's travel histories, and support district-specific tracking. It is a green-yellow-red color-based system, evaluating based on whether one has visited a risk district.

Table 1: A list of the data-driven COVID management systems in Shanghai