THE ROUTLEDGE COMPANION TO MEDIA ANTHROPOLOGY

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15

CLOUDWORK

Data Centre Labour and the Maintenance of Media Infrastructure

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15

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A.R.E. Taylor

I am standing in one of the server rooms of a 100,000-square foot data centre. The facility is owned and operated by GigaTech, a UK-based cloud provider who currently manage three data centres in the London metropolitan area and multiple facilities across geographic regions in Asia (Thailand, India, Singapore and China). I am being given a personal tour of their newest "hyperscale" facility, located on an industrial estate in the outskirts of East London.[1] The server room is blindingly white (Figure 15.1). At one end sit a number of server cabinets, arranged in neat symmetrical aisles. Aside from those cabinets, the room is largely empty, anticipating future growth. Heating, ventilation and air conditioning (HVAC) units, embedded within the walls and ceiling panels, funnel cold air down the aisles, preventing the servers from overheating. If the servers got too hot, their performance decreases, making them more likely to lose data. The noise made by the HVAC system is incredibly loud. I adjust my ear plugs, taken from one of the many dispensers mounted to the walls throughout the data centre. Ear plugs are provided to help engineers avoid hearing damage during long working hours in the noisy server rooms.

I am being guided through the facility by Mike Antin, GigaTech's East London Operations Manager. I had met Antin at a data centre security expo in London. When he heard that I was conducting fieldwork on cloud storage he invited me to GigaTech's newly built data centre. Antin has worked for GigaTech for ten years. He has spent the last few months overseeing the installation of equipment in the new data centre. As we walk down one of the aisles we meet Paul Bradford, one of the data centre's network operations centre (NOC) engineers, who is busy re-bolting a server that he noticed was slightly loose in its rack. He is wearing a large pair of earmuffs, as well as gloves and steel toe-capped boots. "Server racks are made from really sharp metal which can cut your hands up pretty badly", he shouts to me over the ambient noise, "they're also heavy, so you don't want them falling on your feet!". The floor around Bradford is littered with bags of cage nuts and cable off-cuts. He explains that he is now "cabling up" the server, the final stage of the maintenance job. This involves cutting and crimping the cables plugged into the server, in order to keep them neat and tidy. "If your cables aren't in order", Bradford explains, "they can get easily damaged and you run the risk of potentially taking your clients offline". Picking up on Bradford's point, Antin explains that "the whole point of a data centre is to stop downtime at any cost". Downtime refers to the time that a data centre's services are unavailable or offline. "So many services now depend on the cloud", Antin tells me, "that

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Figure 15.1 One of the server rooms in GigaTech's East London facility
Source: https://jamesbridle.com/works/the-cloud-is-a-lie. Photo by author.

if a data centre should momentarily go offline it can cause widespread societal and economic disruption, as well as lasting financial and reputational damage for the data centre provider and their clients".

Data centres provide the cloud computing resources that form the operational backbone of digital societies. Commerce, consumption, distribution and production systems are now mediated on many levels by data centres, which strive to ensure their smooth, reliable and continuous operation. Financial services (banking and insurance), transportation systems (air traffic controls, road and rail signals, driverless cars), global logistics, communications (telephone networks, satellites, messaging apps, videoconferencing platforms), government and emergency services, utility providers (gas, water, electricity), online data storage (iCloud, Dropbox, OneDrive, Google Drive) and internet media services (music and video streaming, online gaming, advertising, social media) now all rely on data centres. With cloud services now connecting and enabling such a large number of sectors across government, business and society, Jean-François Blanchette (2015: 3) has suggested that we think of the cloud as a "meta-infrastructure". Indeed, the apps, software and communications systems provided by data centres are now perceived to connect such an incredible range of services and utilities that, we are told, "modern life wouldn't function without them" (TechUK 2014).

GigaTech was founded in 2011 and serve a large number of national and international customers, ranging from UK-based financial firms and government bodies to global media companies and retail chains. While some data centres house a single company's data and IT equipment, such as Facebook's or Google's facilities, the vast majority of data centre providers operate in public cloud or colocation markets, providing clients with access to computing

resources – from storage capacity to processing power – that they pay for in a pay-as-you-go fashion. This means that clients do not need the large capital outlays required to build and service their own data centres. Many online media corporations, such as Twitter and Netflix, do not operate their own data centres but opt to lease public cloud infrastructure, like Amazon Web Services (AWS).

The GigaTech facility where I conducted my fieldwork forms part of what they call their London data centre "ecosystem". The location on the outskirts of London enables for a variety of connectivity options with different telecommunications carriers while operating at a safe distance from the high-risk city centre (a potential terrorist target), to satisfy disaster recovery requirements. As we continue our walk through the East London facility, Antin turns the conversation towards the growing pressures of the job. "Everyone is moving their data into the 'cloud'", he tells me, placing the word "cloud" in air quotes. "This is great for business", he says, "but they all expect their online services to be constantly available". His words echo out into the whitescape surrounding us. "The problem is", he continues, "end-users tend to forget that their cloud services rely on physical computing machines that are prone to failure, [and] maintaining all of this is exhausting, high-pressure work". Despite the image of immateriality that the "cloud" metaphor conjures, during my tour of GigaTech's facility I learned that, for those who work in the data centre industry that underpins the cloud, this infrastructure is experienced as material, fragile and precarious, and that it takes considerable labour to ensure that cloud services remain constantly online and available.

This chapter follows the high stakes work of those tasked with operating and maintaining cloud infrastructure. I draw from my tour at GigaTech and from subsequent visits and interviews with staff to explore the lived experiences of data centre labour that form the conditions of possibility for cloud media cultures and digital societies. In doing so, I centre "maintenance" as a key, but overlooked, form of media labour. A rich body of ethnographic work has explored the labour of media makers, producers, consumers and distributors. From Powdermaker's (1950) ethnography of the Hollywood studio system, to newsroom ethnographies (Schlesinger 1978; Gans 1979; Tuchman 1991; Born 2005; Boyer 2013), to online content creation (Boellstorff 2008), labour has been widely discussed in empirical studies of media production. Such work has directed attention to the social context of media production, shedding light on the material conditions, professional standards, institutional structures, social relations and values, that shape media workplaces and that ultimately affect the content and meaning of media texts. Beyond media production labour, anthropologists have also explored the work of media consumption, with ethnographic observations of household media habits making valuable contributions to audience reception studies (Moores 1993; Horst 2012). Ethnographies of media labour have also drawn attention to the work involved in media distribution, from the exchange of photographic images (Edwards 2012) to the circulation of hard drives (Cearns 2021).

If production, consumption and distribution have been understood as key media processes, much less attention has been paid to maintenance, and to those who operate and fix media infrastructure. Data centres are essential to the storage, distribution and maintenance of internet media and require continuous upkeep to facilitate the "on-demand", "real-time" and "instant" access that characterises online consumption. A focus on data centres thus invites us to expand the scope of media labour to include the work of those who maintain media infrastructures. If end-users experience online consumption as a relatively smooth process, with content and services available at the click of a button, it is because a vast array of human workers, material infrastructure and extracted energy and resources support that process. A growing body of scholarly literature and investigative journalism is now exploring the invisible forms of labour that take place "behind the screens" of digital media economies, challenging popular

perceptions that online services are driven primarily by automated and algorithmic labour.[2] The "human cloud" is a phrase that has been used to refer to the invisible human labourers that conduct work for cloud platforms (O'Connor 2018), such as the remote "click work" of crowdsourced (or "cloud-sourced") microwork platforms like Amazon Mechanical Turk, and the gig economy jobs generated by on-demand work platforms like Uber, Deliveroo, TaskRabbit, PeoplePerHour, Upwork, Freelancer and Fiverr. Scholarship on digital labour has drawn attention to the unseen workers whose labour produces the smooth-running experience of online services. Yet, while data centres underpin and enable these myriad forms of digital labour, the work that takes place in these buildings has largely remained absent from this literature. One of the key promises of a media-anthropological approach to cloud infrastructure lies in the attention an anthropological focus can direct towards the people and human labour of the data centre industry. This chapter thus aims to develop a more expansive understanding of the "human cloud" by bringing the work of those tasked with operating and maintaining data centres into discussions of digital labour.

The Transcendental Media Imaginary

Popular imaginaries of media technologies often turn around their immaterial and transcendental properties. Historians of communication have illustrated how imaginaries of transcendence over the material constraints of space, time and the human body have been central to understandings of modern media and communications technologies, from the electric telegraph, to the wireless radio, to the telephone (Carey 1989). The transcendental imaginary is certainly not limited to pre-digital communications. Digitisation is often presented as a process of dematerialisation. This was perhaps best characterised by MIT technologist Nicholas Negroponte (1995: 4), who famously described digitisation as a shift "from atoms to bits". As a system of interconnected digital computer networks, the internet, in particular, has been persistently dematerialised in popular discourses and imaginaries, often presented as an "electronic world", "cyberspace" or an "information superhighway" (Mosco 2004). Today the "cloud" metaphor continues this conceptual history of imagining the internet as an immaterial, weightless and ethereal nonplace.

Cultural commentators have noted that the metaphorical conceit of the cloud problematically presents online data storage as a transcendental and placeless operation (Carruth 2014; Taylor 2021a). This imaginary erases any sense of the physicality of the infrastructure and labour that underpin online services and, by extension, renders the geopolitical, social and environmental costs of cloud infrastructure largely invisible. As Arjun Appadurai and Neta Alexander (2020: 16) have observed of cloud computing companies: "the language of immateriality [is] often used to disguise their energy-consuming and environmentally destructive infrastructures". Often understood as sites where the cloud "touches the ground", data centres have surfaced as key buildings through which the materiality of the internet has been unpacked (Holt and Vonderau 2015; Amoore 2018). Data centres are resource-intensive enterprises. They require enormous amounts of electricity and water to power and cool the servers on which they store digital data (Hogan 2015). Their construction often greatly impacts the landscapes, ecologies and communities in which they are sited (Vonderau 2018; Johnson 2019; Brodie 2020). "Grounding the cloud" has become both a mantra and a method for problematising popular metaphors that present digital communications as immaterial and ethereal, often by directing attention to the politics of data centres and their impact on the geographies and communities amidst which they are built (Fard 2020).

This growing interest in the materiality of internet infrastructure has arisen against the backdrop of the "material turn" in media research. This has seen scholarly attention expand from the study of screened content towards the materialities of digital media technologies and their supporting infrastructures (Parks and Starosielski 2015). As Ramón Reichert and Annika Richterich (2015: 7–8) observe "Rather than looking at what happens on the screen and hence concentrating on the representative, accessible side of digital media, the focus shifts to what happens 'behind the screen'". Infrastructure, in particular, has emerged as a valuable ethnographic object and analytic through which scholars have grappled with the materialities of networked cultures. Rather than dismiss transcendental digital imaginaries, scholars of media infrastructure have paid attention to the work that such imaginaries enact in social worlds, approaching infrastructures as simultaneously material, discursive and imaginary.

Human labour has been recognised as a key component of the materiality of media infrastructure (Parks and Starosielski 2015; Roberts 2019). In the early 2000s, communications theorist Greg Downey (2001: 225) observed that studies of internet infrastructure often "fail to include most workers in the mix at all". Downey was writing against popular tendencies to dematerialise internet infrastructure. Today, internet labour issues are generating a tremendous amount of interest from scholars and journalists alike, drawing much-needed attention to the invisible workers of digital economies (Dyer-Witheford 2010; Fuchs and Sevignani 2013). Media exposés have highlighted the poor working conditions of those on the bottom rung of global tech, from those who work in Apple's assembly plants and Amazon's fulfilment centres, to the underpaid labourers (often in Asian countries) who spend their days "farming" resources in virtual worlds on behalf of wealthy gamers in the Global North (Chatfield 2010). Critical data studies scholars have problematised the claims of big data rhetoricians that position data as a "raw" resource that "can speak for itself" (Gitelman 2013), by foregrounding the scientific and technical human labour that goes into cleaning datasets prior to their insertion in the databases of big data science (Ribes and Jackson 2013; Irani 2015; Walford 2017; Plantin 2019). Others have investigated the ways in which online leisure activities, such as live-streaming and content creation, convert the play of users into a form of unremunerated labour ("playbour") by generating value for big tech organisations (Terranova, 2000; Ritzer and Jurgenson, 2010; Goggin 2011). The labour of social media content moderation has also been investigated, tracing the often-traumatic work involved in screening and removing offensive material posted online (Gillespie 2018; Roberts 2019). Studies of "digital labour" now cover a diverse array of work practices in the digital economy.[3] As Jarrett (2020) observes, the concept of "digital labour" now spans an array of phenomena, ranging from "digital transformations of paid work, to creative labor in digital media industries, to the exploitation of user data, to mineral extraction, manufacturing, and electronic waste disposal" (see also Jarrett 2022). Together, scholarship on digital labour has shown that, despite hype surrounding automation, robotics and algorithmic processing, human labour remains a key component of digital capitalism.

The People in the Cloud

Without data centres many of these forms of digital labour would not be possible. The connectivity, apps and access to large data sets that these buildings facilitate, enable the data-driven labour landscapes of the digital economy. Yet little attention has been directed to the work that goes into operating, maintaining and servicing the data centre infrastructure that supports the datafication and digitisation of labour. In much the same way that digital work, such as social media content moderation, may appear automated at the user-end, data

centres themselves are often represented as automated data spaces rather than workplaces. In popular media and industry marketing materials, data centres are typically depicted as machinic worlds full of futuristic computing equipment and flashing server lights, with few, if any, humans in sight (Taylor 2019). These corporate visual communications generate a vision of the data centre as a technological "world without us". Relatedly, the term "infrastructure", which is often used to conceptualise data centres (and which I also use in this chapter), tends to conjure an image of technical systems or nodes, rather than buildings in which people work. But infrastructures are also worksites. While data centres, as buildings, may not immediately be associated with media industries labour (unlike, say, the newspaper publishing houses, film and broadcasting studios, or other monumental buildings of media organisations [Ericson and Riegert 2010; Wallace 2012; Evans 2022]), they are now vital sites of media distribution and maintenance work, with data centre professionals responsible for ensuring that online content reaches its audiences.

To be sure, these buildings are primarily designed for machines, rather than humans. This was highlighted during a data centre management training programme I attended. The course instructor explained that

> the data centre is not a people space. This needs to be made clear up front as it can lead to serious consequences and costs if it is overlooked. The primary aim must always be to support the IT assets which, in turn, support the business need.
>
> *Taylor and Velkova 2021: 295*

For this reason, Kate Jacobson and Mél Hogan (2019) have described the working environment of the data centre as "hostile" to human labour. The structural accommodations needed for the human labour force – the kitchens and toilets, the server aisles wide enough for maintenance staff to access – are often perceived by industry professionals as an inconvenient barrier to data centre optimisation because they reduce the space available for data compute and storage.

The question of human labour has not been neglected in critical studies of the data centre industry. Ethnographic work in regions where these buildings are being constructed has explored how negotiations and agreements to develop data centres are persistently tied to local hopes of regional rejuvenation, particularly in relation to promises of job creation for local working-class labour markets (Vonderau 2018; Johnson 2019; Burrell 2020; Mayer 2019). Asta Vonderau (2018) has explored how the construction of a Facebook data centre in Luleå, Sweden, was tightly entangled with municipal leaders' hopes for job creation. Ultimately, however, Vonderau (2018: 18) observes that the data centre resulted in a "lack of new jobs for locals". Rather than draw from the local labour pool, large tech firms often rely on contractual workers, or import staff from their Silicon Valley offices (Gray and Suri 2019). This is not always the case, as Julia Velkova (2020) has shown in her ethnography of a Yandex data centre in Finland, where she observes that most of the data centre's operators are "locals who live close by the facility" (Velkova 2020: 48).

In another ethnographic context, Alix Johnson (2019: 78) has traced how the development of the data centre industry in Iceland was similarly linked with anticipations for "new high-paying, high-prestige jobs for Icelanders" that never materialised. Elsewhere, Jenna Burrell (2020) has shown how, after the initial building work of a Facebook data centre in Prineville, Oregon, which temporarily provided some job opportunities for local construction workers, it was unclear exactly whether the local labour pool would benefit from the data centre in the

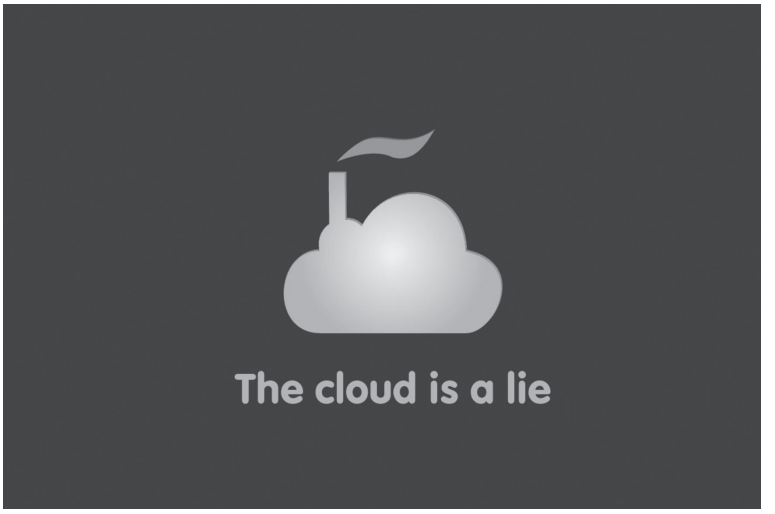

Figure 15.2 "The Cloud is a Lie", James Bridle (2011). Courtesy of the artist
Available online: https://jamesbridle.com/works/the-cloud-is-a-lie

long term. As Burrell (2020: 301) notes: "In Prineville, if one tries to project forward into the future, there are no certainties or stabilities around the question of data center jobs".

Accounts of the data centre industry in the popular press frequently describe these buildings as "cloud factories" (Glanz 2012; see also Cook 2011). However, the factory metaphor is typically invoked to highlight the environmental impact of the data centre industry, drawing a connection between the smoke-cloud-emitting chimney stacks of industrial capitalism and the polluting "cloud" arising from the data centres of digital capitalism, which often rely on fossil fuels to power their equipment (Figure 15.2).

While the factory metaphor does important work in drawing attention to the carbon relations in which the cloud is entangled, there are, as architectural historian Kazys Varnelis (2014) reminds us, "crucial differences between data centers and factories". In comparison to the factories of industrial capitalism, which were key drivers of economic growth through job creation, data centres typically employ a relatively small workforce in proportion to their size. Many data centres have in fact been retrofitted inside former factory buildings (Pickren 2018). However, in repurposing the ruins of industrial capitalism to service the needs of post-industrial digital capitalism, the labour relations of these sites have dramatically shifted (Jacobson and Hogan 2019). This is something that Graham Pickren (2018) has observed in his exploration of the data centre sector that has taken root in former printing and bread-making factories in Chicago's South Loop. Pickren (2018: 26) notes that, while the industrial factory buildings once brought many jobs to the area, in their repurposed form as data centres these buildings "do not employ many people". Commenting on the absence of workers in these buildings Pickren (2018: 26) asks: "If the data centre is the 'factory of the 21st century,' whither the working class?" Scholarship on data centre labour has thus often focused on the promises of job creation that accompany data centre development, and the lack of jobs that data centres provide, rather than the everyday work that takes place in these buildings after their construction. As such, the experiences and perspectives of data centre professionals who work in these spaces has been less often considered.

Cloud Pressure

GigaTech employ 26 people in their East London data centre. These people work across a range of technical, managerial and administrative positions. The team is headed by the Chief Technology Officer (CTO), to whom Antin, the facility Operations Manager, reports. There are seven service desk operators who work in an open-plan office on site and who are responsible for answering support tickets and telephone calls from clients, as well as conducting basic network administration functions. The sales and marketing team, which consists of three people, are also based in the office. There are three receptionists, the only females on site (aside from cleaners), who work in alternating ten-hour shifts, from 8 am to 6 pm. The East London facility is also staffed by a five-man team of security guards who rotate between night and day shifts. They monitor the perimeter of the facility, man guard posts and conduct clearance checks on visitors. There are six technicians who are responsible for installing, repairing and upgrading hardware and software, as well as conducting other basic operational necessities (Figure 15.3). They deal with reported faults and problems that are issued to them via the service desk team. In addition to the core workforce, there are a range of contractors (plumbers, electricians, janitors) who carry out routine cleaning and maintenance work, such as servicing fire alarms and HVAC systems. Aside from the receptionists and cleaners, the staff at GigaTech's East London data centre are all white males. The lack of diversity is not unique to GigaTech but is reflective of larger diversity issues that the industry faces (Judge 2018).

In an economic context that demands "always-on" access to cloud services, there is significant pressure on data centre operators to ensure their systems remain constantly available. For the managers, technicians and security teams who work in the cloud, the day-to-day job is characterised

Figure 15.3 A technician running diagnostic tests to ensure equipment is correctly functioning
Source: Photo by author.

by a state of anticipation for IT failure that could occur at any moment (Taylor 2021a). Their task is to avoid data loss and downtime. As tech journalist Rich Miller (2019a) reminds us, the data centre industry "was created to ensure that mission-critical applications never go offline". During my visit to GigaTech East, Antin explained to me that data centre professionals "always need to be prepared", highlighting that his work rarely stops because he must remain perpetually "on call" in case a failure event should occur. Antin, along with the technicians at GigaTech, uses mobile apps to remotely check the current service levels of the facility when not at the workplace. Data centre work does thus not only take place within the data centre but unfolds across multiple spatial and temporal scales. As Ned Rossiter (2016: 142) observes: "The 24/7 maintenance of servers, for instance, may combine onsite technicians with remote network operators residing in different time zones".

The daily pressure to ensure uninterruptible uptime is especially felt by the technicians who are responsible for installing, testing and servicing the IT equipment. During an interview with GigaTech technician Paul Bradford, who we met at the beginning of this chapter, he described his job as "stressful [because] so much depends on us [technicians] making sure nothing goes wrong". The technicians are one of the few groups of people in the data centre that have access to the server rooms. They spend a large portion of their day moving in and out of the server rooms, maintaining the computing equipment. Bradford explained that he enjoys the mobility of his role. "Most people assume IT guys spend their lives sitting at a computer desk", he said, "but if you work in a data centre, it's hard graft … lots of physical labour, lifting and moving equipment most days … it can be pretty back-breaking work". He explained that the worst part of the job was the night shifts. Like the security guards, the technicians work in shifts, ensuring that the site is manned 24-hours-a-day, all year round. Once or twice a week, depending on the rota, the technicians are required to work a night shift, which generally lasts from 7 pm to 7 am. The majority of a night shift is spent in the network operations centre, a large control room with a range of screens mounted to the walls, displaying power, cooling and network activity, as well as CCTV feeds. Every 90 minutes the technician must inspect the facility. They check the Uninterruptible Power Supply (UPS) rooms and the server rooms, as well as the generators outside the building to make sure they are set to "auto mode". This enables the generators to automatically detect and fix problems without requiring manual intervention (though, somewhat ironically, a member of staff must still be on site to regularly check auto mode is enabled).

During exceptional periods of anticipated service demand, the injunction to ensure uninterruptible service continuity has even led some data centres to invest in sleeping equipment for data centre staff who may have to work around the clock. During the 2012 Olympic Games the London-based data centre, Interxion, installed "sleeping pods" so its staff could remain on site (Miller 2012). More recently, during the Covid-19 pandemic, data centre staff were classed as "key workers" by a number of authorities (Judge 2020a). With schools and workplaces closed, data centre services enabled for a valuable degree of business and societal continuity as many organisations shifted to online remote working. The pressure to ensure uptime during an extended period of increased demand for digital services led some data centre providers to organise on-site sleeping and food supplies for staff. As one data centre provider highlighted, staff had to be prepared "to stay at the data center for a long period of time if need be" (Moss 2020). The requirement for data centre staff to continue working on site during the multiple lockdowns was a reminder that, when "uptime is mandatory" (Miller 2012) there can be no time off.

Antin highlighted that there is also little room for "time off" due to major staffing shortages that the industry is facing. Some industry insiders have suggested that job vacancies in the data centre industry now number 300,000 (Judge 2021). A 2021 report on data

centre staff requirements, titled "The People Challenge" (Uptime Institute 2021), highlights the need to recruit and train a new generation of data centre workers, predicting that growing demand for cloud services "will exacerbate staffing shortages" (Uptime Institute 2021: 1), pushing data centre staff workloads to increasingly unsustainable levels. Indeed, a 2019 forecast highlighted that the work entailed in meeting consumer expectations for uninterruptible service delivery is testing "the endurance of key specialists" (Miller 2019b). Highlighting the exhausting levels of work involved, the forecast states that "There is a real risk that the level of activity causes burnout on your network team" (Miller 2019b). In a 2021 survey collecting feedback about the future of the data centre workforce, the pressure of ensuring uninterrupted uptime was identified as one feature that may deter young people from entering the industry, with the survey asking participants whether they agree that "The always-on urgency associated with data centers is off-putting to most graduates" (Data Center Dynamics 2021).

Caring for Data

When we centre the people that run cloud infrastructure, questions of maintenance inevitably rise. As Kate Jacobson and Mél Hogan (2019: 89) have observed, "the vast majority of work currently done in data centres is what would best be termed 'maintenance' labour". As a sphere of work, maintenance has been historically undervalued in cultures obsessed with technological novelty and "innovation" (Russell and Vinsel 2020). Media studies scholars and anthropologists have now begun to seriously engage with practices of maintenance and repair (Jackson 2014; Starosielski 2015; Mattern 2018). The work of data centre professionals plays an important but neglected role in the maintenance of online media cultures.

Data centre technicians loosely divide data centre maintenance into two temporal categories: "anticipatory" and "reactive". Reactive maintenance is work that takes place after an incident has occurred. This could be the work of a plumber repairing a broken air conditioner or efforts to diagnose a software bug that has disrupted service delivery. Despite efforts to anticipate downtime, disconnection and failure events invariably occur. Server maintenance, hacker-led server overloads due to DDoS attacks (see Parikka 2015) or surges in active users (e.g. when a new app launches or when content goes viral) can all result in service disruptions. These moments of connective disruption often materialise at the user-end in the form of loading screens, buffering icons or error messages. While data centres tend to exist at a remove from end-users, sometimes these error screens attempt to visualise data centre maintenance, providing non-technical end-users with a vague sense of their relationship to data centre staff (Figure 15.4).

In the data centre industry, significant time, money and energy is invested in efforts to anticipate breakdowns and thus avoid reactive maintenance labour. Anticipatory maintenance seeks to pre-empt downtime through a range of preparedness measures, such as regularly servicing generators, updating ventilation ductwork, ensuring that all redundant electrical components are frequently tested and in working order, and stress-testing equipment to make sure that it can operate under heavy or unexpected demand. The importance of stress-testing was highlighted by Bradford: "Before any new kit goes into our core we load it onto a test [server] rack to make sure that it doesn't crap out under duress, … this helps to avoid phone calls from concerned clients at 2 am in the morning". Another key practice of anticipatory maintenance is the retiring of servers before their mechanical parts begin to deteriorate. Despite marketing metaphors that present online data storage as a transcendental and immaterial operation, for data centre technicians like Bradford, digital storage media, like servers, are fragile material

Something went wrong

We're having issues loading this page.

Try again

Figure 15.4 LinkedIn's service disruption error screen visualises data centre server maintenance, providing users with a momentary hint of the labour and infrastructure that otherwise remains distant and unseen behind the screen

Source: Screenshot by author.

things that must be handled with care to ensure the data stored on them is not damaged or lost. Servers are upgraded roughly every twelve months in the data centre industry. A considerable part of data centre work thus involves regularly migrating data to new servers in an effort to ensure the terabytes of data stored on them remain accessible not only in the present but into the future (Taylor 2021b).

Through these anticipatory and reactive maintenance practices, data centre technicians enact a specific form of "care for the data" (Fortun and Fortun 2005: 47). This is a phrase that Kim Fortun and Mike Fortun have used in their fieldwork with toxicologists who work with large volumes of toxicogenomic data. Through the lens of "care" they describe the various ways that toxicologists strive to practice "good science" by ensuring the accuracy of their insights through careful analysis of the data made available to them. In the data centre industry, relations of care are enacted through the routine maintenance practices that aim to avoid data loss and ensure the uninterrupted delivery of cloud services – from handling hardware with care to carefully arranging cables in server cabinets.

While "care" is essential to data centre maintenance, human "carelessness" is considered a key vulnerability. Indeed, human error, rather than machine error, is often positioned in industry discourse as a leading cause of data centre downtime (Taylor 2019). Automation is widely seen to offer a means to reduce the vulnerabilities associated with human workers. In contrast to human operators that must be trained, paid, placed on call, and who may make mistakes, the automated data centre, decoupled from human labour, promises to "predict its own maintenance, diagnose its own errors, and implement its own recovery plan" (Munn 2020: 172). Faced with the growing pressures arising from understaffed data centres coupled with an increasing demand for always-on digital services, attempts to automate the monitoring and maintenance of data centres are now accelerating. A growing number of data centres are investing heavily in artificial intelligence (AI) and robotics, with the hope that intelligent nonhuman systems

will eventually carry out technical tasks, such as removing and replacing faulty servers, that are currently conducted by human technicians (Burrell 2020: 299; Munn 2020: 172). In 2020, the data centre provider Switch announced that they were developing self-driving sentry robots to patrol their facilities (Judge 2020b). It is unclear whether this project ever materailised. Hyperlinks to the Switch sentry webpage no longer work, possibly suggesting that this attempt to automate the work of security guards failed.

While the development of fully automated, self-healing data centres may eventually reduce or eliminate jobs for human maintainers, for understaffed and overwhelmed technical departments in the present, these developments promise relief. As Antin told me: "Automation isn't being driven by the need to improve data centre efficiency but by staff shortages … There's simply too much work to do and not enough people to do it".

Conclusion

Visions of AI-driven maintenance and "lights-out" or "dark" data centres (facilities in which no lights are needed because there are no human operators) are proliferating in the sector. At the moment, however, data centres remain, for the most part, largely reliant on human labour to function. Cleaners, contractors, receptionists, facility managers, disaster recovery officers, security guards, service desk operators, technicians and sales and marketing teams are just some of the people that run and maintain GigaTech's East London data centre. Data centres are enabling developments in algo-robotic automation, which threatens to render many high- and low-skilled jobs obsolete – perhaps including the work of data centre professionals themselves – but the human has yet to be completely removed from the loop.[4] The industry's continued reliance on human labour was made glaringly obvious throughout the sector during the Covid-19 pandemic. In a news article on the industry's response to the pandemic, one data centre provider highlighted the importance of on-site staff when it comes to delivering uninterruptible services, explaining that "essential operations staff" will remain "on-site to continue guaranteeing 100 percent uptime" (Moss 2020). The data centre provider emphasised that "We will always have someone [at the data centre], so if an immediate quarantine was called where no one can leave, there will be someone present … There never is and never will be a moment when it goes completely unoccupied".

Anthropology's attunement to the human offers an understanding of data centres not as automated data spaces but as workplaces that are reliant on myriad forms of upkeep and maintenance. A media-anthropological focus on the labour of data centre workers draws attention to the importance of infrastructure maintenance as a critical form of media labour for online cultures, highlighting practices of maintenance as vital to the storage, circulation, preservation and distribution of internet media and communications services. While the circulation and consumption of online media is often described using the language of "flows" and "streams", it takes considerable work to make media flow smoothly. The work of data centre staff, along with the work of other media infrastructure maintainers, such as Wi-Fi engineers and fibre-optic cable engineers, facilitates the smooth flow of online media, cultivating the fiction of digital automation in the process. As Antin put it, "without us [data centre workers] the digital world stops". Through the often-exhausting work of regularly servicing, updating and upgrading servers and other IT equipment, data centre technicians aim to ensure that cloud services remain instantly and constantly available, ready to be accessed, streamed or downloaded at the click of a button, at any time. The goal is to render these services "uninterruptible", that is, to eliminate the possibility of a single moment when online services are not available. By extension, of course, this work serves to maintain the constant connectivity, voracious online

consumption (the "binge-watching" and "infinite scrolling"), and continuous data extraction that characterises cloud capitalism.

Notes

1 All names have been changed to protect the privacy of the data centre professionals with whom I worked during the period of field research presented in this chapter.
2 This literature builds on a longstanding body of scholarship exploring the invisible labour of IT workers and service technicians (Orr 1996; Nardi and Engeström 1999; Star 1999; Downey 2001).
3 Given the sheer breadth of work activity that is now being brought together under the category of digital labour, some have questioned the meaningfulness of this umbrella term (Gandini 2021).
4 As Gavin Mueller (2021: 115) has stated, "automation never completely erases human labour".

References

Amoore, L. (2018) "Cloud Geographies: Computing, Data, Sovereignty", *Progress in Human Geography*, 42: 4–24.

Appadurai, A. and N. Alexander (2020) *Failure*, Cambridge: Polity Press.

Blanchette, J. (2015) "Introduction: Computing's Infrastructural Moment", in C.S. Yoo and J. Blanchette (eds), *Regulating the Cloud: Policy for Computing Infrastructure*, Cambridge, MA: MIT Press: 1–20.

Boellstorff, T. (2008) *Coming of Age in Second Life: An Anthropologist Explores the Virtually Human*, Princeton: Princeton University Press.

Born, G. (2005) *Uncertain Vision: Birt, Dyke and the Reinvention of the BBC*, London: Secker and Warburg.

Boyer, D. (2013) *The Life Informatic: Newsmaking in the Digital Era*, Ithaca, NY: Cornell University Press.

Brodie, P. (2020) "'Stuck in Mud in the Fields of Athenry': Apple, Territory, and Popular Politics", *Culture Machine*, 19: 1–34.

Burrell, J. (2020) "On Half-Built Assemblages: Waiting for a Data Center in Prineville, Oregon", *Engaging Science, Technology, and Society*, 6: 283–305.

Carruth, A. (2014) "The Digital Cloud and the Micropolitics of Energy", *Public Culture*, 26: 339–364.

Carey, J.W. (1989) *Communication as Culture: Essays on Media and Society*, Boston: Unwin Hyman.

Cearns, J. (2012) "Connecting (to) Cuba: Transnational Digital Flows between Havana and the Cuban Diaspora", *Cuban Studies*, 50: 161–185.

Chatfield, T. (2010) *Fun, Inc. Why Games are the 21st Century's Most Serious Business*, London: Virgin Books.

Cook, G. (2011) "How Dirty is Your Data?" available at www. greenpeace.org/international/Global/international/publications/ climate/2011/Cool%20IT/dirty-data-report-greenpeace.pdf (accessed 23 October 2021).

Data Center Dynamics. (2021) "What is the Impact of the Skills Gap on the Data Center Industry?" available at: www.datacenterdynamics.com/en/whitepapers/the-impact-of-the-skills-gap-on-the-european-data-center-industry/ (accessed 21 October 2021).

Downey, G. (2001) "Virtual Webs, Physical Technologies, and Hidden Workers: The Spaces of Labor in Information Internetworks", *Technology and Culture*, 42(2): 209–235.

Dyer-Witheford, N. (2010) "Digital Labour, Species-becoming and the Global Worker", *Ephemera*, 10(3): 484–503.

Edwards, E. (2012) "Objects of Affect: Photography Beyond the Image", *Annual Review of Anthropology*, 41: 221–234.

Ericson, S. and Riegert, K. (2010) *Media Houses: Architecture, Media and the Production of Centrality*. New York: Peter Lang.

Evans, E. (2022) "Bricks, Mortar, and Media: Understanding the Media Industries through their Buildings", in P. McDonald (ed.), *The Routledge Companion to Media Industries*. London: Routledge: 212–222.

Fard, A. (2020) "Cloudy Landscapes: On the Extended Geography of Smart Urbanism", *Telematics and Informatics*, 55: 1–11.

Fortun, K. and Fortun, M. (2005) "Scientific Imaginaries and Ethical Plateaus in Contemporary U.S. Toxicology", *American Anthropologist*, 107(1): 43–54.

Fuchs, C. and Sevignani, S. (2013) "What Is Digital Labour? What Is Digital Work? What's Their Difference? And Why Do These Questions Matter for Understanding Social Media?" *tripleC: Communication, Capitalism & Critique*, 11(2): 237–293.

Gandini, A. (2021) "Digital Labour: An Empty Signifier?" *Media, Culture & Society*, 43(2): 369–380.
Gans, H.J. (1979) *Deciding What's News. A Study of CBS Evening News, NBC Nightly News, Newsweek and Time*, New York: Pantheon Books.
Gillespie, T. (2018) *Custodians of the Internet: Platforms, Content Moderation, and the Hidden Decisions that Shape Social Media*, New Haven, CT: Yale University Press.
Gitelman, L. (2013) *Raw Data is an Oxymoron*, Cambridge, MA: MIT Press.
Glanz, J. (2012) "The Cloud Factories: Power, Pollution and the Internet", *The New York Times*, 22 September, available at www.nytimes.com/2012/09/23/technology/data-centers-waste-vast-amounts-of-energy-belying-industry-image.html (accessed 16 October 2021).
Goggin, J. (2011) "Playbour, Farming and Leisure", *Ephemera*, 11(4): 357–368.
Golding, P. and Elliot, P. (1979) *Making the News*. London: Longman.
Graham, S and Thrift, N. (2007) "Out of Order: Understanding Repair and Maintenance", *Theory, Culture & Society*, 24(3): 1–25.
Gray, M.L. and Suri, S. (2019) *Ghost Work: How to Stop Silicon Valley from Building a New Global Underclass*, Boston, MA: Houghton Mifflin Harcourt.
Hogan, M. (2015) "Data Flows and Water Woes: The Utah Data Center", *Big Data & Society*, 2(2): 1–12.
Holt, J. and Vonderau, P. (2015) "'Where the Internet Lives': Data Centers as Cloud Infrastructure", in L. Parks and N. Starosielski (eds), *Signal Traffic: Critical Studies of Media Infrastructures*, Urbana, IL: University of Illinois Press: 71–93.
Horst, H.A. (2012) "New Media Technologies in Everyday Life", in H.A. Horst and D. Miller (eds) *Digital Anthropology*, London: Berg: 39–60.
Irani, L. (2015) "Justice for 'Data Janitors'", available at www.publicbooks.org/justice-for-data-janitors/ (accessed 6 October 2021).
Jarrett, K. (2022) *Digital Labor*, Cambridge: Polity.
Jarrett, K. (2020) "Digital Labor", in K. Ross, I. Bachmann, V. Cardo, S. Moorti and C.M. Scarcelli (eds), *The International Encyclopedia of Gender, Media, and Communication*, available at https://onlinelibrary.wiley.com/doi/full/10.1002/9781119429128.iegmc008 (accessed 3 October 2021).
Jackson, S.J. (2014) "Rethinking Repair", in T. Gillespie, P.J. Boczkowski and K.A. Foot (eds), *Media Technologies: Essays on Communication, Materiality, and Society*, Cambridge, MA: MIT Press: 221–240.
Jacobson, K and Hogan, M. (2019) "Retrofitted Data Centres: A New World in the Shell of the Old", *Work Organisation, Labour and Globalisation*, 13(2): 78–94.
Johnson, A. (2019) "Data Centers as Infrastructural Inbetweens", *American Ethnologist*, 46: 75–88.
Judge, P. (2018) "Diversity Won't Solve Itself", available at www.datacenterdynamics.com/en/opinions/diversity-wont-solve-itself/ (accessed 23 September 2021).
Judge, P. (2020a) "Data Center Staff Classed As 'Essential' During Pandemic", available at www.datacenterdynamics.com/en/news/data-center-staff-classed-essential-during-pandemic/ (accessed 12 October 2021).
Judge, P. (2020b) "Switch plans to launch security robots for data centers", available at www.datacenterdynamics.com/en/news/switch-plans-launch-security-robots-data-centers/ (accessed 20 September 2021).
Judge, P. (2021) "Data Centers Need to Find 300,000 More Staff by 2025", available at www.datacenterdynamics.com/en/news/data-centers-need-find-300000-more-staff-2025/ (accessed 15 September 2021).
Mattern, S (2018) "Maintenance and Care", available at https://placesjournal.org/article/maintenance-and-care/ (accessed 6 October 2021).
Mayer, V. (2019) "The Second Coming: Google and Internet Infrastructure", *Culture Machine*, 18: 1–10.
Miller, R. (2012) "Interxion Readies Staff 'Sleeping Pods' for Olympics", available at www.datacenterknowledge.com/archives/2012/04/12/interxion-readies-staff-sleeping-pods-for-olympics (accessed 4 October 2021).
Miller, R. (2019a) "Rethinking Redundancy: Is Culture Part of the Problem?" available at https://datacenterfrontier.com/rethinking-redundancy-is-culture-part-of-the-problem/ (accessed 4 September 2021).
Miller, R. (2019b) "The Eight Trends That Will Shape the Data Center Industry in 2019", available at https://datacenterfrontier.com/the-eight-trends-that-will-shape-the-data-center-industry-in-2019/ (accessed 3 September 2021).
Moores, S. (1993) *Interpreting Audiences: The Ethnography of Media Consumption*, London: Sage.
Mosco, V. (2004) *The Digital Sublime: Myth, Power, and Cyberspace*. Cambridge, MA: MIT Press.

Moss, S. (2020) "Italy's Coronavirus Lockdown: The View from SuperNAP", available at www.datacenterdynamics.com/en/analysis/italys-coronavirus-lockdown-the-view-from-supernap/ (accessed 3 October 2021).

Mueller, G (2021) *Breaking Things at Work: Why the Luddites Were Right About Why You Hate Your Job*. London: Verso.

Munn, L. (2020) "Injecting Failure: Data Center Infrastructures and the Imaginaries of Resilience", *The Information Society*, 36(3): 167–176.

Nardi, B. and Engeström, Y. (1999) "A Web on the Wind: The Structure of Invisible Work", *Computer Supported Cooperative Work* (CSCW), 8: 1–8.

Negroponte, N. (1995) *Being Digital*, New York: Knopf.

O'Connor, S (2018) "The Human Cloud", *Financial Times*, 30 October, available at www.ft.com/content/5fe8991e-dc2a-11e8-8f50-cbae5495d92b (accessed 12 September 2021).

Orr, J.E. (1996) *Talking About Machines: An Ethnography of a Modern Job*. Ithaca and London: Cornell University Press.

Parikka, J. (2015) "Denials of Service", in I. Kaldrack and M. Leeker (eds), *There is No Software, There are Just Services*. Lüneburg: Meson Press: 103–111.

Parks, L. and Starosielski, N. (2015) *Signal Traffic: Critical Studies of Media Infrastructures*. Urbana, IL: University of Illinois Press.

Pickren, G. (2018) "The Factories of the Past are Turning into the Data Centers of the Future", *Imaginations: Journal of Cross-Cultural Image Studies*, 8(2): 22–29.

Powdermaker, H. (1950) *Hollywood, the Dream Factory*, Boston: Grosset and Dunlap.

Plantin, J. (2019) "Data Cleaners for Pristine Datasets: Visibility and Invisibility of Data Processors in Social Science", *Science, Technology, & Human Values*, 44(1): 52–73.

Reichert, R. and Richterich, A. (2015) "Introduction. Digital Materialism", *Digital Culture & Society*, 1(1): 5–17.

Ribes, D. and Jackson, S.J. (2013) "Data Bite Man: The Work of Sustaining a Long-Term Study", in L. Gitelman (ed.), *"Raw Data" is an Oxymoron*. Cambridge, MA: MIT Press: 146–166.

Ritzer, G. and Jurgenson, N. (2010) "Production, Consumption, Prosumption: The Nature of Capitalism in the Age of the Digital 'Prosumer'", *Journal of Consumer Culture*, 10(1): 13–36.

Roberts, S.T. (2019) *Behind the Screen: Content Moderation in the Shadows of Social Media*. New Haven: Yale University Press.

Rossiter, N. (2016) *Software, Infrastructure, Labour: A Media Theory of Logistical Nightmares*. London: Routledge.

Russell, A.L. and Vinsel, L. (2020) *The Innovation Delusion: How Our Obsession with the New Has Disrupted the Work that Matters Most*. New York: Random House.

Schlesinger, P. (1978) *Putting "Reality" Together: BBC News*. London: Constable.

Star, S.L. (1999) "The Ethnography of Infrastructure", American Behavioral Scientist, 43(3): 377–391.

Starosielski, N (2015) *The Undersea Network*. Durham, NC: Duke University Press.

Taylor, A.R.E. (2019) "The Data Centre as Technological Wilderness", *Culture Machine*, 18: 1–30.

Taylor, A.R.E. (2021a) "Standing by for Data Loss: Failure, Preparedness and the Cloud", *Ephemera*, 21(1): 59–93.

Taylor, A.R.E. (2021b) "Future-proof: Bunkered Data Centres and the Selling of Ultra-secure Cloud Storage", *Journal of the Royal Anthropological Institute*, 26(S1): 76–94.

Taylor, A.R.E. and Velkova, J. (2021) "Sensing Data Centres", in N. Klimburg-Witjes, N. Poechhacker and G.C. Bowker (eds), *Sensing In/Securities: Sensors as Transnational Security Infrastructures*. Manchester: Mattering Press: 287–298.

TechUK. (2014) "Data Centre Publications", available at www.techuk.org/insights/reports/item/1858-data-centre-publications (accessed 6 September 2021).

Terranova, T. (2000) "Free Labor: Producing Culture for the Digital Economy", *Social Text*, 18(2): 33–58.

Tuchman, G. (1991) "Qualitative Methods in the Study of News", in K.B. Jensen and N. Jankowski (eds), *A Handbook of Qualitative Methodologies for Mass Communication Research*. London: Routledge: 93–106.

Uptime Institute. (2021) "The People Challenge: Global Data Center Staffing Forecast 2021-2025", available at https://uptimeinstitute.com/global-data-center-staffing-forecast-2021-2025 (accessed 3 September 2021).

Varnelis, K. (2014) "Eyes That ~~Do Not~~ See: Tracking the Self in the Age of the Data Center", *Harvard Design Magazine*, 38, available online www.harvarddesignmagazine.org/issues/ 38/eyes-that-do-not-see-tracking-the-self-in-the-age-of-the-data-center (accessed 12 October 2021).

Velkova, J. (2020) "The Art of Guarding the Russian Cloud: Infrastructural Labour in a Yandex Data Centre in Finland", *Digital Icons: Studies in Russian, Eurasian and Central European New Media*, 20: 47–63.

Vonderau, A. (2018) "Technologies of Imagination: Locating the Cloud in Sweden's Global North", *Imaginations: Journal of Cross-Cultural Image Studies*, 8(20): 8–21.

Walford, A. (2017) "Raw Data: Making Relations Matter", *Social Analysis*, 61(2): 65–80.

Wallace, A. (2012) *Media Capital: Architecture and Communications in New York City*. Urbana: University of Illinois Press.