Atmospheric conditioning: Airport automation, labour and the COVID-19 pandemic

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Abstract
This paper contributes to debates on human–technologies relations and labour geographies. It thinks through how the adoption of automation is mediated by the conditioning effects of atmospheres in space. Taking the occasion of the COVID-19 pandemic, the paper presents a case of how atmospheres are capable of determining the trajectories of automation, and providing the guiding backdrop for technological (un)development. Drawing on 40 semi-structured interviews conducted with airport labour in Singapore in 2020 at the height of the COVID-19 pandemic, the paper offers an analysis of how airport workers variously and viscerally capitulate to, abandon, and/or desire to collaborate with automation, in ways that are both unstable and atmospherically implicated. To the extent that these affective responses have the potential to change the course of technological and labour futures in airport infrastructures, atmospheres — especially those deliberately advocated by the state and airport management — are also a political force to be reckoned with. The paper concludes with a discussion on how a focus on atmospheres can push geographic research on automation in productive and interesting directions. It views automation not just as a collection of abstract artefacts, but projects constantly subject to the conditioning effects of invisible atmospheres.

KEYWORDS
airport infrastructure, atmosphere, automation, COVID-19, labour, technology

1 | INTRODUCTION

In recent years, the subject of automation has gained considerable attention in geography and the social sciences. The COVID-19 pandemic has only sharpened this focus, raising questions about the future of society, and the relationship between technology and life-after-lockdown (Chen et al., 2020). One persistent thread relates to automation’s impact on labour, as advancements in robotics, artificial intelligence, and data computing look set to overtake a wide swath of roles formerly performed by humans. From cashiers to drivers to personal assistants, the acceleration of “automatic society” appears to be breaking the “virtuous cycle” of technology-enabled productivity gains and rising purchasing power (Stiegler, 2016, p. 3). In fact, the growing sophistication of machines has the distinct ability to augur the demise of the
middle class, as automation gradually replaces all sectors of the economy (McNeill, 2015; Oppenheimer, 2019; West, 2018).

Geographers have sought to temper the said threat with other, non-linear, perspectives of automation. While noting labour’s ability to adapt through “reskilling” and “upskilling” (Richardson & Bissell, 2019), some have pointed to the instability of technology itself, and how imaginaries, practices, and situated encounters can all contribute “to the production of what automation is” (Bissell, 2021, p. 367; see also Hale, 2018; Kinsley, 2018). As Warf avers, technologies “are not simply ‘things’ – machines, robots, airplanes – but systems that enmesh people, objects, knowledge, techniques, procedures, and places into a seamlessly integrated whole” (2017, p. 1; original emphasis). This suggests that, rather than being pre-formed artefacts, technologies take their form by constantly entering into recursive relationships with their social agents and environs.

This paper aims to add to these debates by thinking through how the adoption of automation is further mediated, and politicised, by the conditioning effects of atmospheres. Behaving in ways that precede the individual, but yet depending on bodies, objects, and specific geographic situations (or lack thereof) to take shape, atmospheres provide a powerful, if subtle, backdrop for the articulation of technological (un)development. Here, I adapt Ingold’s (2008) understanding of atmospheres (as a terrestrial–aerial interface) to the socio-materialities of living under the cloud of technology. Conceiving them as encompassing envelopes that preside over life’s turbulent affairs (see also Adey, 2014; McCormack, 2018), Ingold (2008) likens atmospheres to a “weather-world” that is capable of steering moods, (re)actions, and outcomes for those inhabiting it. It portends the presence of an unseen “aerography” (Jackson & Fannin, 2011) hanging in the air, that can, among other things, influence and condition how people align themselves with automation.

The ongoing COVID-19 pandemic is an event that has seen multiple intrusions of such life-changing atmospheres. Indeed, these highly tumultuous times (Castree et al., 2020; Rose-Redwood et al., 2020) are marked by growing schisms of inequality, political-economic upheavals, environmental disturbances, and emotional distresses that COVID-19 has at once exposed, exploited, and exacerbated (see, for example, Cresswell, 2021; Ho & Maddrell, 2021; Sparke & Anguelov, 2020). In the arena of automation, generic concerns for improving efficiency through technology have given way to problematic visions of contactless societies, unprecedented forms of health surveillance, and the re-engineering of urban economies built on high automation and a complementary army of menial labour such as delivery riders. This paper argues that atmospheres are an important medium through which such outcomes are precipitated, not least, by cajoling, persuading, and instigating people — including the very labour that automation would transform — to move and conform to their sensibilities. Seen thus, while COVID-19 may have spurred particular technological rationalities, the atmospheres it generates have helped create the imperatives and impulses for driving these projects forward.

Leveraging on this exceptional period of uncertainty, the following four sections proceed to think through how atmospheres can conceptually afford another kind of political relationship between humans and machines that is affectively mediated. In the next section, I sketch out some recent debates on how automation has the potential to alter the value and agency of labour. Section 3 provides a theoretical discussion on atmospheres, and how these turbulent (trans)formations offer an intervening conduit to reset and redirect social realities. Section 4 moves to analytically reflect on what atmospheres might practically entail for technological (un)development. Drawing on a ten-month-long empirical research on airport labour and automation in Singapore amid the COVID-19 pandemic, it evinces three ways by which technologies had been tumultuously devalued/revalued in conjunction with various atmospheres that successively formed in the city-state. The section will move through three phases corresponding with automation’s overdrive (by an atmosphere of deflation), abandonment (amid a state of flickering), and resurrection (due to buoyant confidence in aviation). The concluding section considers how an attention to atmospheres can push research on automation in productive and interesting directions — not as an affordance of reasoned thinking and action, but as part of a ‘weather-world’ of unanticipated fluidities (Ingold, 2012).

2 | AUTOMATION AND LABOUR

Automation has been a salient topic in geography in recent years. While the term does not adhere to any single definition, there is consensus among scholars that it refers to the institution of some manner of self-organisation in machines and facilities. For Torrens (2010, p. 138), automation sits astride a “continuum” of applications that permit varying degrees of human non-intervention. Whereas some types identify more closely with mechanisation, others — especially when combined with “code” (Thrift & French, 2002) — are able to process information and perform a range of non-menial, non-repetitive work “without human oversight or authorization” (Kitchin & Dodge, 2011, p. 5). In the past decade, automated
technologies have become even more sophisticated, with robotics, artificial intelligence, and data computing leading the charge. These innovations not only process far larger amounts of information than ever before, but also in ways that can adapt to complex situations, anticipate future scenarios, and aid in physical task actuation (Amoore, 2020; Crampton, 2016; Macrorie et al., 2019; Stilgoe, 2019). Seen in this light, the crux of automation today no longer resides in the supportive roles that machines used to play, but, rather, in their ability to mimic, or even exceed, humans.

These developments have implications for questions of skill and human/non-human relations in labour geographies (Ellem, 2016; Lynch & Del Casino, 2020; Richardson & Bissell, 2019). As Bissell and Del Casino cite recent think tank reports, almost half of "current jobs are at risk of replacement by robotics and automation technologies" (2017, p. 436), as machines overtake humans not just in efficiency but also accuracy and complexity. These predictions of the gradual "displacement" of workers (Pierce et al., 2019) are echoed by a number of cultural and media theorists, who foresee radical changes in the future structures of the global economy. While some decry the coming reorganisation of labour to maximise capital’s gain (Rossiter, 2016), others emphasise the need to install proper safety nets to ensure social reproduction (Bastani, 2019; West, 2018). For Strauss, the precarity of work is likely to spill beyond the manufacturing sector, as an "accelerated pace of technological change, including automation and the applications of artificial intelligence (AI)" spread "to an increasingly wide range of tasks" (2020, p. 1214; see also Oppenheimer, 2019; Rossiter, 2016; Waite & Lewis, 2017).

Yet, some scholars argue that advancements in automation have also augured opportunities for labour to experiment with new — and sometimes more progressive — work practices. Notwithstanding that these benefits are often splintered along social lines like gender and race (Maddrell et al., 2019; Nast, 2015; Reid-Musson et al., 2020), geographers have underscored how labour still possesses a high degree of agency to adapt and respond to automation. As Richardson and Bissell (2019, p. 278) assert, while the present technological revolution does make certain types of work obsolete, it has simultaneously fostered new work processes and technological exposures by which "re-skilling" and "up-skilling" can take place. Similarly, Lynch and Del Casino (2020, p. 383) caution against "a binary logic" that strictly bifurcates humans from nonhumans, the conscious from the unconscious. Instead, they call for an attention to the entanglements and interdependencies between not one but multiple intelligences at work, as devices become extensions of the (post)human body and mind (see Hayles, 2017; Rose, 2017). Straddling a range of evolving relationships with humans, automation may not always abrogate the need for labour, but rather enrol (and depend on) humans to enable new collaborations.

Such relations spur fixed suppositions of how humans and nonhumans "ought to" interact. Stressing the situatedness of work, Bissell contends that labour's everyday encounters with machines can provide "a powerful redress to both technocratic accounts of automation that present a universalised view from nowhere ... and political economy analyses that take empirical occasions involving automation to be the mere playing out of pregiven power relations" (2021, p. 367). Such a sensitivity to everyday practices is well-demonstrated, especially, by research on gig economy labour. For example, Timko and van Melik insist that "on-demand platform work," such as in food delivery, does not merely automate a retail interface (see also Richardson, 2020) but is also "circumscribed within the context in which it takes place and entangled with a diverse array of elements including objects, infrastructure, institutions, and discourses, as well as the minds and bodies of those who carry the practices themselves" (2021, p. 21). Attending to the ways in which delivery riders share tips with one another, form social support groups, and manage downtime through idling, their research showcases a number of strategies that these platform workers use to cope with the demands of algorithms, re-engaging with automation through their immediate encounters.

Other scholars take this trope one step further by contemplating how labour can assume a more proactive posture in re-appropriating technologies. Reclaiming what Lynch (2020a) calls "technological sovereignty," purposeful ground-up initiatives among users of automation can potentially drive techno-social reformulations in material ways, through alternative, counter-hegemonic (re)imaginations of technology. By constantly availing space for such experimentations — such as in the creative use of apps (Cockayne et al., 2017; Elwood & Leszczynski, 2018), anticipatory learning in autonomous driving (Lindgren et al., 2020), or the infusion of human aims and ideals in platform logic (Ruckenstein & Turunen, 2020) — labour and other consumers of automation can help disrupt "the abstract logics of digitization," challenging "hierarchies of technological knowledge and expertise" from below (Lynch, 2020b, p. 3). Such attempts at re-valuing technology is not always game-changing, but neither is it a wistful position of counter-hegemony. As Bissell’s (2018, p. 59) analysis on the social repercussions of the 2017 fatal crash involving an Uber autonomous vehicle in Tempe, Arizona shows, "the magic of automata" can quickly evaporate with just a single encounter with "interruption," enabling "public dispositions" to shift and reconsolidate around new technological norms and ways of acting.

Indeed, the disruptive potential of automation notwithstanding, scholars are increasingly cognisant of the importance of human practices and situated encounters in re-writing the trajectories of automation. As Bissell avers, "rather
than imagining automation as something singular and stable,” scholars need to pay greater attention to the “different understandings of automation” (2021, p. 369) at the juncture of use. By opening the door to such immediate social contexts, automation also becomes but a provisional body of inventions, whose meaning can only ever be as relevant as its appropriations. This paper seeks to extend these debates by contemplating how atmospheres are another intervening force that can cause technologies to (suddenly) gain momentum, fade away, or be reinvigorated, if in more affecting and collective ways. Such a stance does not simply re-capture the inherent instabilities within automation, but emphasises the more-than-social conditions that atmospheres constantly introduce to technological projects beyond discrete events or human encounters. Although invisible, atmospheres as such persist as ever-lurking potentials that, too, can redefine what automation is.

3 | ATMOSPHERIC INTERVENTIONS

Often imagined as airy and barely perceptible, atmospheres may seem to be an antithesis to the solidity of automation. Yet, as distributed spaces that suffuse the world, atmospheres are powerful circulations in their own right. In a meteorological sense, atmospheres are foundational to processes on earth, being that gaseous matter “that surrounds and sustains us” (Adey, 2014, p. 2), and that provides the inescapable condition of biological life (Irigaray, 1999). In a more artful sense, atmospheres are also frequently fabricated — such as through the envelopment of air in a balloon — to generate a condition of sensing; or a range of ‘aesthetic’ qualities ‘characterized by a degree of allure or enchantment’ (McCormack, 2018, p. 6). Seen as such, atmospheres have the capacity to shape and define realities and sensibilities of/in the world, changing the way people live and relate.

This pervasive, life-giving property of atmospheres has prompted some geographers to argue for a need to take the ontogenesis of airy spaces — or what Jackson and Fannin (2011) dub "aerographies" — seriously. Postulating an "aether theory," Olwig (2011, p. 529) advocates thinking atmospherically as a means to turn “inside out ... our familiar picture of the world” through a deliberate attunement to the abstract and intangible. This attraction to the vagueness of atmospheres suggests a reality that falls in the interstices of the material and immaterial. Congruous with Law’s (1999, p. 4) post-ANT approach, the focus here no longer lies in the pinpointing of observable structures and agencies to divine (false) orders, but of the invisible atmospheric movements and dynamics that drive order-ings. Put alternatively, the earthly actor no longer takes centre-stage, but something far more speculative that cannot but hang in the air.

Still, atmospheres are not disconnected from the concrete spatial milieus within which they are generated. While McCormack reminds that these "diffuse, airy, affective spacetimes ... operate across, between, and beyond bodies and things" (2018, p. 6), Edensor and Sumartojo write that "atmospheres are multiply composed out of phenomenological and sensual elements, and the social and cultural contexts in which they are consumed, interpreted and engaged with emotionally as well as affectively" (2015, p. 252). Architectural theorist Böhme more explicitly states that atmospheres “involve a concept of space, or rather an experience of space” (2002, p. 405). Tying the (sensing) subject with co-present objects, he considers atmospheres as the active result of the articulation of space (by objects), and the conveyor of moods (as experienced by subjects). Bille (2015) further corroborates this idea when he uses the Danish word hygge (roughly translated as "cosiness") to illustrate how "hazy" sensibilities and affects attune people to everyday domestic spaces. Reflecting on the way furniture, lighting, smells, and sounds softly interact with one another to exude a flavour of "home," he demonstrates how a focus on atmospheres can enable a perspectival "shift from what a thing is or is enacted to be, to ... how and why the world is present as it is" (Bille, 2015, p. 268). In these renderings, atmospheres capture, "in spaces, the seriousness of life" (Böhme, 2002, p. 406), and are what ascribe meaning to the same.

An analogous idea is offered by Ingold’s (2012) notion of the "weather-world," which allows atmospheres to be projected onto larger scales. Equally capable of driving human temperaments, the weather-world, for Ingold (2012), is a "mood space" similar to, but also far more expansive and variant than, Böhme’s (2002) indoor spaces. Conceptually, he cites Serres (1995) to evince how "weather" and "time" (both translated as temps in French) potentially harbour the notion of “mixing” (temperare in Latin) and turbulence (Ingold, 2012, p. 76). Here, the weather is generative not just by dint of the moods conveyed by objects, but also because of the unceasing churning of elements that determine, moment by moment, swirl by swirl, the manner of interaction one can have in the world. Conceived thus, atmosphere stresses habitation over occupation, and medium over surface. Living beings, in turn, “make their way through a nascent world rather than across its preformed surface” (Ingold, 2011, p. 73; original emphasis). In so doing, they encounter a host of fluctuant circumstances and conditions in space, “all of which fundamentally affect their moods and motivations, their movements and their possibilities of subsistence” (Ingold, 2011, p. 73).
These provocations on atmospheric ontologies signal that socio-spatial phenomena — which I extend to the use of technology — may entail more than individual-based practices and observable encounters. Instead, they are simultaneously caught up in often-unseen affective circulations in the air that mediate individual moods and attunements to everyday life, hence leading to specific actions and dispositions. Writing appositely on technoscience, Law and Mol allude to the power of such diffuse spatialities in producing “the circumstances in which shapes will change their form or not” (2001, p. 612) in technological inventions. On the one hand, the very presence of technology (as object) already impels new engagements with space and itself, especially where machines create unfamiliar — or sometimes dull familiar — sensate experiences (on automatic lighting, see Pink & Sumartojo, 2018); on the other hand, the climate (or weather) in which machines are found can also more collectively affect sensibilities about them, such as in times of mass emergency (Anderson, 2014), or (the production of) crisis (Roitman, 2013). Arguably, both scenarios are influenced by specific pathways of becoming that atmospheres afford. By immersing their inhabitants, atmospheres work less through immediacy or tactility than through lingering senses and feelings.

A couple of metaphors can advance these ideas further, both of which, incidentally, reflect different aspects of atmosphere and technology. The first pertains to fire, a primitive invention that straddles between presence and absence. Remarkably, the shape of a fire — or its flicker — is not dependent on any fixed dimensions. Rather, it is the product of “multiple present peripheries” conjoining to form “a single absent center,” presenting to viewers different auras of itself as atmospheric conditions fluctuate (Vasantkumar, 2013, p. 929). Such definitional uncertainty (of what “fire” is) is replicated in the aircraft wing, whose aerodynamic expression also does not follow any formalism by design. Instead, the concept of ‘optimal’ lift is wrapped up in various hidden “Othernesses that are both expelled and drawn in” at once during (wind tunnel) testing (Law, 2002, p. 117), leaving a trail of possibilities for designers in its wake. To extrapolate these metaphors beyond flame and flight, science and technology are, then, emergent through the changing winds of chance and circumstance (Law & Mol, 2001). While users’ practices and encounters do contribute to this variability, there may yet be another coeval, and subtler, potentiality — in excess of individual cognition and interaction — that conditions interpretations of technology. It is here that the pressures of atmospheres also become significant, prevent realities from falling neatly between “this” or “that” (Ingold, 2008, p. 1804).

Bringing atmospheres bear on technology in these ways has important ramifications for understandings of automation. Explicitly, the rise (and fall) of automation is not merely held in tension by a realist network of agencies straddling between makers and users (Lynch, 2020b), but is held up by all kinds of spatially emergent atmospheres that selectively valorise, legitimise, and necessitate particular attitudes toward automation. From the point of view of labour, this affective pandering to certain ascendant values and norms renders atmospheres hard-to-deflect and political. While there may have been times when technocrats’ visions can be actively resisted, they become much more difficult to challenge if they are embedded within prevailing climates. Seen as such, automation’s trajectories are not just made sense of through dominant narratives, or the slow creep of their everyday use; instead, they also make sense within the media of atmospheres — of hygges, turbulent weather-worlds, flickers, and aerodynamic experiments — that contribute viscerally toward their adoption, elimination, and/or rebirth.

## 4 COVID-19, ATMOSPHERES, AND AIRPORT AUTOMATION

The COVID-19 pandemic provides a distinctive, crisis-filled backdrop to operationalise these ideas on atmospheres, automation, and labour. An outbreak that has upended the world, COVID-19 has not only radically changed the way people live and work, but has also led to extreme emotional, environmental, and political turbulence at variable scales. From increased global geopolitical fragmentation (Dodds et al., 2020), to the hardship of lockdowns and mobility restrictions (Adey et al., 2021), to personal distresses of mortality, unemployment, and inequality (Ho & Maddrell, 2021), the global health-cum-economic emergency has produced one-too-many gut-wrenching moments of anxiety and despair in countless contexts (Castree et al., 2020; Rose-Redwood et al., 2020).

This is not to say that experiences of the pandemic have been uniform. As Sparke and Anguelov remind, “our unequal contexts and conditions of being human make for vast variations in vulnerability” (2020, p. 499). While, at one extreme, the homeless are made to be personally responsible for sheltering-in-place in the absence of shelter, some of the world’s wealthiest nations have displayed incredible resilience with their surfeit of healthcare (and other) resources (Sparke & Anguelov, 2020). One strategy such nations took was to turn to automation to soften the blow of COVID-19’s disruption, and to prioritise economic imperatives over personal woes such as labour retrenchment (While et al., 2021). In Singapore, where this research was undertaken, the government had declared to citizens that the economy would
forever change because of the pandemic, with a gravitation toward more “science and technology” jobs and automation (Today, 2020). Aviation, a key pillar of the city-state’s raison d’être and, ironically, the gateway for the local epidemic, became a bellwether sector in which to experiment with such sleek new technological solutions — from touchless kiosks to green passports to Bluetooth-enabled contact tracers. Synecdochically, the city’s main airport, Changi, would serve as a site where such (uneven) values of technoscience were first scripted, and gradually disseminated to the rest of the nation.

Ambivalent feelings of succour and hope but also vulnerability to technology created a perfect storm for all kinds of atmospheres to coalesce in Singapore and Changi. In 2020, the city-state underwent three marked periods of atmospheric turbulence corresponding to a national lockdown and complete border closure (March to June); cautious reopening and the establishment of precautionary measures (July to September); and a fragile return to normalcy, including the acceptance of incoming foreign workers and tourists (October to December, and beyond). I refer to 40 semi-structured interviews conducted with airport workers in check-in (20) and gate-boarding (20) operations during the same periods to interrogate how frontline staff perceived their job at different times. The workers involved were all employed at Singapore’s airport at the time of interview, comprising 11 male officers, and 29 female ones, broadly reflecting the gender balance of these roles. Recruitment was done at the airport, accompanied by snowballing to increase the number of participants. Initially, these workers could be readily approached at idle check-in desks, but, over time, increasing numbers were redeployed to take on administrative work in community centres and as support staff in food supply chains.

These different batches of participants, and the ways in which their experience evolved over time, afforded a compressed view of how various shape-shifting atmospheres buffeted workers and their attitudes toward (airport) automation during the pandemic. In particular, analysing their changing moods allows academic attentuations to be drawn into alignment with the “commonplace labor of becoming sentient to the world’s work” (Stewart, 2011, p. 445). On the one hand, these workers served as direct stakeholders who facilitated, understood, and had the pulse on the execution of airport automation; on the other, they were semi-skilled staff whose job security was acutely threatened by these machines. Their narratives are juxtaposed against local news articles (The Straits Times) published in 2020 for a sense of how the pandemic was changing (in) the city-state. Emphatically, the purpose of tracing these various stories is not to present empirical results on the success of airport automation in Singapore. Rather, I use them as foils for contemplating how workers often viscerally, and unstably, capitulate to, sidestep, and wed themselves to automation, in ways that are both atmospherically reactive and materially consequential to themselves.

4.1 | Deflation

March 2020: the carnage of COVID-19 on aviation was on full display. Blanket flight bans and a crippling fear of disease contraction had led to a catastrophic decline in global air traffic by 94.3 percent year-on-year in April (International Air Transport Association, 2020a). In Singapore, the numbers were even starker, as passenger volumes plunged to just 25,200 that same month: a 99.5 percent dip from April 2019 (The Straits Times, 2020a). Meanwhile, on the heels of an unprecedented hard border closure on 22 March, the city-state would go into a nationwide lockdown under strict stay-home orders on 7 April. A series of no less than four government financial packages — encouragingly named Unity, Resilience, Fortitude, and Solidarity budgets — were rolled out in as many months to staunch the economic fallout, with special assistance directed at the aviation sector, including job support schemes (Ministry of Finance, 2020). The unfolding crisis quickly produced a heightened atmosphere of panic and pessimism that engulfed the industry.

However, it was in the space of the airport where these atmospheres were most palpably felt. Normally inhabited by workers and passengers, the airport was now marked by unusually empty departure and arrival halls, shut check-in desks, and rows of unused self-service kiosks (Figure 1) that reflected not only a precipitous drying up of passenger traffic, but also a haemorrhaging of jobs. A glimpse of this gloom was provided by a research team member’s field notes for that period:

[M]any airport staff were either put on no-pay leave or retrenched. Visits to the airport also clued us into the situation, as the airport was visibly empty, a stark contrast to the hustle and bustle from before the pandemic. At times during interviews, I felt apologetic and guilty for asking for their personal reflections regarding their jobs, knowing full well that … job security during the pandemic was bleak.
Indeed, many (migrant) respondents — including Filipinos, Malaysians, and Taiwanese among others — were repatriated just weeks after being interviewed. Some spoke of 'friends' who were laid off or were on the verge of leaving the country, enveloping the airport with a sense of deflation, departure, and demise. This depressive cloud had had a particular effect on the way workers perceived (and capitulated to) automation. Previously, automated kiosks were seen as a supplement to airport workers who were in short supply locally (hence the need for migrant workers), as conveyed by this 20-year check-in veteran:

A lot of [Singaporean] families they have one to two kids. So, the parents will say, why do you need to work shift[s] ... And then get this little pay, and then you go and suffer and get scolding by people ... ? They’re not like last time. So, I think in a lot of case[s], ... you can’t get a human, you need ... some machines to help you. (Check-in officer A, Interview, Singaporean, 10 March 2020)

However, amid the souring atmosphere in the airport, less senior officers were beginning to sound more ambivalent about their relationship with automation:

I am quite ambivalent about it (automation) ... machines do not need to take breaks, or have MCs (take medical leave) ... (Check-in officer B, Interview, Singaporean, 12 March 2020)

Instead of entertaining machines as nonhuman peers that could help support a bustling industry, workers were confronted with an unusual scene of dearth (amid a sea of machines) that viscerally challenged their relevance. It was in this context that some respondents were contemplating the idea that technology could potentially supersede them, by being immune to lethargy and, especially now, pathogens.

A number of respondents further drove home this point by seemingly resigning to automation’s onward march in a post-COVID-19 world. (Not) coincidentally, there was beginning to be a concurrent push for robotic solutions by airport management — including in Singapore — to increase investment in technologies such as biometric check-ins and computed tomography security checks, to facilitate future 'touchless' airport environments (Deloitte, 2020). Consider these narratives:

Previously I had a trainer [who] said if we just do our jobs, the machines wouldn’t affect us. But if in the future, say if these machines like improve ... to a point that it can replace us ... I feel that it would definitely have an impact. (Check-in officer C, Interview, Malaysian, 13 March 2020)

Passenger will say to us, like, you know the machine is taking our ... job, like that ... All the thing keep jin bu [progressing] ... So we can’t say anything and also can’t do anything. (Check-in officer D, Interview, Taiwanese, 13 March 2020)
Noteworthy in these excerpts is not just the belief in the inevitable ascent of automation, but also an unspoken burden that the former exuberance of a thriving airport (where labour was short) had given way to the very real possibility (and palpability) of negative "impacts" on job security. While some of these workers acknowledged that their profession was not likely to disappear entirely, it was difficult to ignore the dejection that was newly arising as the airport space visibly hosted (and welcomed) fewer human contacts.

These workers’ rethinking of their relationship with automation must be couched within the intensely deflationary atmospheres that had engulfed their workplace. In particular, stark terminal spaces had attuned airport workers to the sensibilities and affects of their disuse, as well as dented their confidence in the future of human labour. From scenes of empty check-in desks to the decimation of crowds, the abrupt shift in the spatial experience of "how and why the world is present as it is" (Bille, 2015, p. 268) not only made technological threats seem more real, but also ever-so-subtly instigated atmospheres that had engulfed their workplace. In particular, stark terminal spaces had attuned airport workers to the atmospheres that had engulfed their workplace. In particular, stark terminal spaces had attuned airport workers to the atmospheres that had engulfed their workplace. In particular, stark terminal spaces had attuned airport workers to the atmospheres that had engulfed their workplace. In particular, stark terminal spaces had attuned airport workers to the atmospheres that had engulfed their workplace. In particular, stark terminal spaces had attuned airport workers to the atmospheres that had engulfed their workplace.

While atmospheres do pass, they tend to do the most harm when prevailing "weather-worlds" (Ingold, 2008) afford political censure to foreclose debate and other possibilities. The next section will now turn to another stage of the pandemic to illuminate how automation can, by the same token, fall out of favour, as new turbulences gather.

### 4.2 Flickering

July 2020: Six months into the pandemic, the initial hype of a technology-mediated future had given way to exasperation in the aviation industry. Airlines had grown weary of the endless travel restrictions, and were calling on governments to "safely reopen borders without quarantine by implementing systematic, rapid testing of all international travelers" (International Air Transport Association, 2020b, p. 1). Meanwhile, the travelling public’s ire was starting to show, with air rage incidents ticking up — particularly around the issues of (non-)mask-wearing and increased flight cancellations (Street, 2020). Spurning the idea of leaving middle seats empty, airlines had been filling up aircraft; some even offered packed flights-to-nowhere and group lunches aboard parked aircraft to raise cash (Asaf, 2020). Bearing traces of a world fatigued by the virus, the atmospheric consistency of the pandemic was flickering, and a different "center" was forming out of other "peripheral" concerns (Vasantkumar, 2013, p. 929).

Singapore was not exempt from such fluctuations and was, by then, eagerly anticipating a return to normalcy, as it emerged from a self-imposed lockdown. Changi airport — a barometer of the city-state’s economic health — had begun re-accepting transit passengers, resulting in a small uptick in passenger traffic to 86,000 in July 2020. Navigating the trough of the crisis, aviation management put in place a suite of safety measures intended to safeguard the airport’s inhabitants, with passengers flying through Changi needing to be guided to dedicated transit areas by staff, have their temperatures taken, wear a face mask (plus face shield and gloves for staff), and follow safe-distancing markers strictly (The Straits Times, 2020b). Arriving passengers also had to undergo compulsory swab tests, and be taken to quarantine hotels by dedicated transport, greatly lengthening processing times. Somewhat modestly, new forms of automation — namely kiosks installed with proximity touch screens, lifts with contactless buttons, and hands-free toilets — were being trialled then, aimed at reducing passenger contact with common surfaces (The Straits Times, 2020c). In a few short months, the empty airport had thus been turned into an epidemiological sorting and prevention machine, purposed to keep aeromobilities moving again through Singapore.

These additional procedures and fixtures produced an atmosphere that resembled that of a health triage centre rather than an airport. Reminiscent of Jensen’s "atmosphere of fear and risk" (2021, p. 75), bodies with face — and sometimes full dress — coverings, moving briskly through the airport in special lines and to exclusive zones, characterised this space now. Whereas workers had earlier on expressed anxieties about their job security, the gamut of new routines, ironically, required them to perform even more labour-intensive work — including checking, chaperoning, and (behavioural) correcting. This all happened not only to keep up with the cadence of an efficient airport, but also to fend off the miasma of disease:
The staff... were scared lah. The urge for them to [not] touch the keyboard, or maybe talk to your working colleagues... When we eat together, [we] will wash hand together... put on the gloves, put on the mask, wash your hands, [after] go[ing] to toilet. So, each and every one we support each other by giving sanitiser, every minute and every second. (Check-in officer E, Interview, Singaporean, 27 July 2020)

While Changi had fared better than other airports where COVID-19 fatalities arose among workers, occasional outbreaks among staff were still not unheard of (The Straits Times, 2020d). Even as the airport was eager to resume “essential” air transport services, it also relied on putting labour at risk, and subjecting them to a new spatiality (and rhythm) of work.

Amid such a changed weather-world, the relationship between labour and automation took another turn. Looking for ways to cope with the more tedious passenger facilitation procedures while staying safe, gate-boarding officer F assessed that technology was simply irrelevant to his job now:

Automation during this time has... been fully shut down... there’s so much of regulations, and so much things that we need to check... everything all goes back... to square one. (Interview, Filipino, 22 September 2020)

Another respondent more explicitly recalls the time (and safety) pressure of assisting passengers using the check-in kiosks with proximity touch screens. Instead of extolling their contactless features, her abandonment of the kiosk after just five minutes and referral of passengers to (plexi-glass shielded) check-in counters was suggestive of the prevailing temperament at that time (both in the health-triage airport and the socially distanced city more broadly) that discouraged interactions:

Right now they [are] also implementing a new system... however the checks is very, very slow. Is like the old system you can use within two minutes... But this new system..., it takes about a freaking five minutes over there, and I cannot let the passenger go through a transaction [huffs]. Then I have no choice. Then, I just ask passenger go to the counter. (Check-in officer G, Interview, Singaporean, 25 August 2020)

The immersion of workers within an epidemiologically tense atmosphere left little time and incentive for fiddling with new technologies. Instead, it instigated an attitudinal shift that saw workers turn to other ways of making do, such as assiduously maintaining hygiene standards, directing passengers to manual lines, and forgoing machines altogether. Offering a different ‘possibility of subsistence’ (Ingold, 2011, p. 73), the technocratic solutions inadvertently created an environment that sterilised any motivation to look to technology for support.

This about-turn opens up a potential for sudden compromises in the aerographical compositions undergirding technological expansion. On the one hand, such backtracking is part and parcel of what Serres (1995) describes as temperare in fluid worlds — i.e., a turbulence that continually produces “spirals,” an “evolution towards something other than the same... [that] disturbs the chain... troubles the flow of the identical” (Serres, 2000, p. 110). Akin to a fire or flame (Law & Mol, 2001), these inconsistencies are characteristic for their flickering, dimming, and re-centring as circumstances re-constitute around them. The abrupt shelving of airport automation at Changi airport in the course of the (same) pandemic exactly shows how these ethereal swings can be sudden and reactive, leaving the trajectories of technology susceptible to the vagaries of disaffinity, frustration, and other estrangements. Indeed, similar unwindings of automation’s euphoria can be seen, too, in a variety of glitches in other autonomous systems, where safety fears, antagonisms, and other airs of repulsion unexpectedly erupt (Bissell, 2018). As technologies flex in value according to these swirls, the durability of grand visions of automation also become suspect. In some instances, the atmospheres mediating such human/nonhuman relationships can so rapidly deteriorate that automation becomes irrelevant.

On the other hand, the shutdown of automation at Changi also uncovers a political dimension in the (re)distribution of work. Explicitly, the onerous safety measures that rendered the machines out-of-step were also the same ones that required workers to assume responsibility when the former failed. Part of this was of course tied to the unequal power relations between employer and workers (especially during the pandemic); but the atmospheres created out of this briskness must also be recognised for their inalienable role in prodding workers to perform tasks faster, while reminding them of the infectious threats in the airport. Disturbingly, that newly developed machines tailored to the hygiene necessities of COVID-19 (i.e., kiosks with proximity touch screens) were routinely sidestepped not only proves the less-than-stellar efficacy of remedial design; it also signals the manner of technological help workers were actually getting at the time amid such a high-vigilance setting and environment.
4.3 Buoyancy

October 2020: The final quarter of the year ushered in an optimistic mood that gave automation a new lease of life. The news of the availability of effective vaccines — made possible by automated data testing and manufacturing processes — buoyed sentiments in Asia at the end of a devastating 2020. Gleaning experience from previous months, wealthier nations had further put in place various automatic contact-tracing and surveillance solutions to suppress ongoing outbreaks (Leswing, 2020). If not quite the futuristic world of robots and people-less functioning first imagined, automation — of a "lite" and assistive form — seemed to be working as a panacea that would separate the winners and losers.

Singapore was not tardy in taking advantage of these technological affordances. In fact, it was one of the first countries to receive Pfizer-BioNTech vaccines in December 2020 (The Straits Times, 2020e), and had launched contact tracing apps in March the same year (The Straits Times, 2020f). Confidence was high after authorities managed to squash the first major wave of infections between March and May 2020, allowing the country to selectively reopen its borders toward the later part of the year. Mandating the use of tracing tokens, ‘essential’ travellers from Australia, Brunei, China, Malaysia, Japan, New Zealand, the Republic of Korea, and Vietnam were, at one point, granted inbound quarantine-free access in October 2020, even as bilateral, all-purpose "air travel bubbles" were being negotiated with other jurisdictions. Domestically, half of the workforce could go back to their offices, while greater numbers of people were allowed to throng malls, return to the cinemas, visit attractions, attend weddings, and join religious services (The Straits Times, 2020g). With the country’s outlook brightening, authorities began to claim victory over the pandemic, lauding their technological foresight.

These glimmers of hope seeped into the weather-worlds of Changi, especially with the planned inauguration of the Hong Kong–Singapore air travel bubble on 22 November 2020 (although it eventually never took off). Anticipating up to 200 passengers a day plying between the two cities, special passenger facilitation arrangements were readied at the airport to welcome the first mass leisure travellers since the pandemic began. Several respondents interviewed then were notably sanguine about the prospects of a recovery. Consider gate-boarding officer H, who, in a sprightly tone, almost could not contain her pride to be working at the airport:

To be honest ... they deduct our salary fifty percent also, but, I’m still manageable. I’m happy to do this work, and I’m doing my work and happy. Even though more stressed ... every passenger we see is challenging for us, but end of the day, it goes smooth and everybody happy. (Interview, Malaysian, 23 September 2020)

This respondent was one of the first to sound a "happy" optimism that others after her would soon follow. A stabilising COVID-19 situation in Singapore — coupled with visibly rising passenger numbers at Changi, and "full flights" from "China and India," as other interviewees reported — augured that the worst of the downturn was over. With such a resumption of activities, the atmosphere in the airport had changed yet again, from one in the doldrums and heightened alert, to one of anticipation.

This buoyancy gained height and began shifting airport workers’ narratives about automation, although most technological functions were not yet brought back online. Some, like gate-boarding officer I, reminisced about the benefits of automation:

[Automation] make it faster in a sense that we do not need to check their passport details, [or do] passport tally check already, because [at] the automated gate there is a face sensor. So, if you go to our manual [lane] right, we need to ask for their passport to make the verification of the face. (Interview, Singaporean, 6 October 2020)

Contradictorily to an earlier account on the slowness of kiosks, another respondent "missed" the convenience of having more machines do passenger verification work:

I do miss automation ... because it’s actually much more efficient. Because sometimes if you check at the counter, at boarding gate it may take some time. Sometimes we check in detail it may take ... up to 30 minutes due to certain visa requirements ... so it drag quite some time. So I don’t recommend go to the counter unless it’s necessary. (Gate-boarding officer J, Singaporean, Interview, 30 November 2020).

Yet others speculated about the option of a future Quick Response (QR) certification code, echoing Singaporean authorities’ visions of automatic health checks for future travellers. By dint of a sheer change in urban/national moods, these later
participants were clearly more enthused than those before to see automation in collaborative terms. Instead of fearing or disregarding it, they now viewed automation as an enabler of better work practices, in line with management’s beliefs.

This third atmospheric perturbation marked a period of renewed confidence in automation, as the city was once again bustling, and Changi was seeing increased passenger traffic. Like an aircraft wing undergoing (re)design during wind tunnel tests (Law, 2002), favourable draughts can confer (and, in this instance, had conferred) sudden buoyancy to stalling technological projects. Seen as such, automation does not map onto “static concepts,” but has a “politics and time” that can precipitously make machines more desirable at particular junctures, as visions of the future blow in their favour (Carolan, 2020, p. 198). Specifically, these buoyancies do not locate the coherence of any object in its apparent “thingness,” but invoke vague interplays of hopeful imaginations, perceptions, and (happy) affectivities that go on to valorise automation. By attending to how such atmospheres condition an appreciation for technology, a new politics of automation where labour willingly cooperates with it, and becomes complicit in its resurgence, also becomes conceivable.

Such a reading portends a more insidious role that atmospheres play in the elevation of technology, in that they can be easily stoked by authorities to generate excitement, buy-ins, and feelings of hope. While in Singapore the said exuberance would later prove to be short-lived (having been truncated by another COVID-19 wave beginning, in the airport, in April 2021), its consolidation in late 2020 did, for a moment, offer a real potential for human–machine relations to be reset. This raises important questions about where labour actually sits in the arc of automation, especially if such “positive” energies are deliberately engineered, or tied to (seemingly effective) technological solutions, to secure their conformance and acquiescence. If successfully harnessed to persuade, lure, and entice remaining workers, decision-makers could proceed with even bolder automation plans in the future, ensuring the dispensability of staff who were laid off. This is also a conundrum that each worker will face as automation continues to be advocated and lauded by capital; with every yielding to technology’s atmospheric crescendos is the very real risk of loss for others.

5 | CONCLUSIONS

This paper extends existing debates on human–machine relations (Bissell, 2018, 2021; Kinsley, 2018) by thinking through how the adoption of automation is closely tied to the atmospheres surrounding it. Caught in the whirlwinds of COVID-19, the study takes occasion of the pandemic — itself a catalyst for a frenzied clamour for technological answers — and considers how such atmospheres had played a hand in conditioning and guiding automation’s shifting trajectories in Singapore’s Changi airport in 2020. Specifically, the crisis has highlighted, if in an extreme way, how quickly atmospheres — sometimes proving deflationary, sometimes unstably flickering, and sometimes becoming buoyant again — could change the way airport workers saw and approached automation from one time-period to the next. While discourse and encounter remain important in determining what automation is (Bissell, 2021; Ruckenstein & Turunen, 2020), these atmospheres can have an equally profound effect on technology’s (dis)use.

Attending to whether or not automation gains, loses, or reclaims traction because of these atmospheric conditions gives credence to technology’s hitherto-neglected aerographical dimensions (Jackson & Fannin, 2011). Indeed, tracing the atmospheric movements, undulations, and disturbances surrounding automation accords it (and its actualisation) an affective quality that eludes pure rationality — whether on the part of capital, or on the part of labour/people wishing to challenge the abstraction of technology (Elwood & Leszczynski, 2018; Lynch, 2020a, 2020b). A focus on these subjective forces critically underscores the pertinence of feeling bodies and sentence in easing particular technological dispositions into being. It demonstrates how technologies are not dependent on material networks alone but are frequently caught up in immaterial aethers, weather-worlds, and felt ecologies (Ingold, 2008; Olwig, 2011) that move labour — and presumably other actors such as designers, planners, customers — to react to machines in more-than-intentional ways. These diffuse media, which “fundamentally affect … moods and motivations” and “possibilities of subsistence” (Ingold, 2011, p. 73), both extend the tenuousness of automation beyond its immediate practice (see Lindgren et al., 2020; Pink & Sumartojo, 2018) and also points to the instrumentality of such “spatial experience” in steering the “seriousness of life” (Böhme, 2002, p. 406).

By the same token, these atmospheric influences are far from a-political. The pandemic stories in this paper, if anything, have foregrounded how atmospheres and their exertions can spell very real detrimental effects for labour, especially precarious (migrant) workers. Already earning a modest salary on a contractual basis (that is furthermore subject to 50 percent cuts in times of crisis), the respondents in this study repeatedly found themselves instigated to accept crisis change (Roitman, 2013) — ranging from no-pay leave to the accommodation of subpar or future technologies — by way of atmospheric cues. While I do not want to attribute these cues wholly to airport management or the state apart from the
virus, the atmospheric contexts in which these workers’ narratives are framed (often, at their expense) cannot be divorced from the particular ways in which dominant actors tried to create certain automative visions and/or claim victory over outbreaks through technology. Adding to the growing body of geographic work on COVID-19 (Adey et al., 2021; Castree et al., 2020; Ho & Maddrell, 2021; Sparke & Anguelov, 2020), this piece thus offers a further recognition of the inequalities and exclusions ushered in by the pandemic. It provides a glimpse of the micro-dynamics mediated by atmospheres that pitch (airport) work, labour, and automation one against another, to allow capital the best chance of survival.

Notwithstanding, there should be no illusion that harnessing atmospheres for the purpose of coaxing cooperation from labour is an easy feat. Atmospheres are, by nature, difficult to control (Böhme, 2002), and require constant and deft interventions. As the (temporary) shutdown of automation at Changi briefly showed, technological projects like the proximity touch screen kiosks can even be spurned, if they jar with atmospheres that demand a different tempo. While this rejection of technology did not last (and in fact came with non-technical expectations on labour to increase manual workload), it hints of intermittent gaps in life’s circumstances where other (minority) interests can be scouted out or pursued. Indeed, riding on these cresting moods to obtain better terms for workers amid machines’ deficiencies could potentially lend a space for workers to set a different course for themselves.

This aptly draws the paper to a final contemplation on the conceptual value of atmosphere in redressing big claims about new technological turns in the last decade. Here, I am referring to seemingly "global" or "universally shared" coalescences in technophilia that, especially after the pandemic (Chen et al., 2020), have (at least discursively) gained speed. As a growing "axiom" conflating the "future" of humanity with automative solutions, this almost taken-for-granted celebration of "modern" machines has been roundly advocated by not just global capitalists but also governments, economic forums, the media, and even academia. Rather than presupposing a world (over)run by robots, artificial intelligence, and data computing, atmosphere points to a different vision and possibility — of a world whose technophilic logics could indeed escalate, but is also highly prone to its unsettling capacities. This paper’s ruminations on Changi airport represent a timely reminder of how fragile and contextual automation’s charms can be. Shrouded beneath grand technological orders and pronouncements are in fact local weather-worlds that affect and impress how humans and machines are to coexist.

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