The *Digital* Hostile Environment: Technology and Migration

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Abstract

This thesis investigates the design, technical features and producers of digital border technologies in the United Kingdom (UK) to uncover the power relations of migration governance practices fulfilled through computer systems. Under the Hostile Environment policies, the border checks of the UK increasingly have become internalised and spread to everyday spaces to create unliveable conditions for migrants by weaponizing the health sector, housing, employment and benefits. By combining the academic and non-academic critiques on the racialised, datafied Hostile Environment, this thesis argues how the intentions of the Hostile Environment are encoded into border technologies. Previous academic research has emphasised the harms, risk and threat to belonging that the internalisation of borders introduces to marginalised communities in the UK. Work by non-profit organisations have called to attention the impact of data sharing and instability of digital systems in holding immigration status. By the use of mixed methods - semi-structured interviews, Freedom of Information requests and system mapping – this thesis reveals the bias in Home Office administrative technologies. The thesis consists of three case studies - The Streaming Tool, The Sham Marriage Tool and the caseworking system, Atlas - to reveal how the digital systems perpetuate racialised outcomes and patterns of sociotechnical harms in the administrative technologies of the Home Office. The findings demonstrate that the algorithmic tools, Streaming and Sham Marriage tools, perpetuate racialised outcomes with and without the direct input of nationality. Subsequently, this thesis argues that these outcomes demonstrate how the logics of digital tools are poised to reinforce past migration patterns. Building on these biased features of automation, the thesis reveals how the development of Atlas to integrate algorithmic processes within the main system to manage migration is poised to perpetuate sociotechnical harms, by contributing to the non-functionality of data systems. This thesis concludes by identifying how private actors enhance the themes of adaptability, accountability and reliance on digital systems within the Home Office. From an infrastructural understanding of how digital systems influence and shape the form of the border, it is then demonstrated how future research can identify the Americanisation of the UK border, from the reliance and introduction of American technology companies. By making visible the bias algorithms, caseworking systems and plethora of private actors maintaining border technology, this thesis broadens the conception of the *Digital* Hostile Environment.

Table of Contents

Figures

Abbreviations:

CARs- Complexity Assessment Routing Solution

CID - Case Information Database

CLOUD ACT - Clarifying Lawful Overseas Use of Data

COMPAS -Correctional Offender Management Profiling for Alternative Sanctions

DACC - Data Analytics and Competency Centre

DPIA - Data Protection Impact Assessments

DSA - Data Science and Analytics

DfE - Department for Education

DLUHC - Department of Levelling Up and Housing and Communities

DWP - Department for Work and Pensions

EAA - European Economic Area

EUSS - EU Resettlement Scheme

FDP - Federated Data Platform

FOI - Freedom of Information

GDPR - General Data Protection Regulation

GVRS- Global Visa Risk Streaming

HMRC - Her Majesty Revenue and Customs

ICIBI - Independent Chief Inspector of Borders and Immigration

IPT - Immigration Platform Technologies

JCWI – Joint Council for the Welfare of Immigrants

MoU - Memorandum of Understanding

NAO - National Audit Office

NHS - National Health Service

PLP - Public Law Project

SIS - Schengen Information System

STS - Science and Technology Studies

UKVI – United Kingdom Immigration and Visa

UNHCR - United Nations High Commission of Refugees

VC - Visa and Citizenship

Chapter One: Introduction

In 2019, I applied for my second Tier 4 visa at the Home Office, the UK department responsible for immigration and borders. My application process was smooth and courteous. I queued with other visa applicants and breezed through the English-only instruction on where to stand, where to go and whom to speak to about my application. After walking into a photo booth-like biometric scanner, I was interviewed briefly by a Home Office worker about my in-country application. She asked me why I wanted to stay in the UK. I replied that I really liked it here and could not live without biscuits. She smiled warmly, and I went on my way, quickly receiving my visa acceptance via email and continuing with my studies. I often think about my encounter with the Home Office, for my experience of ease, light-hearted humour, and only mild anxiety about visa acceptance is not a universal experience. When I consider the vastly different experiences people have with the application of visas, I, as an American national, can move through the world with general ease. For those not presented with the invisible gates of visas, the standards, practices and infrastructure upholding mobility rights may fade into the background. The upholding of the material barricades to mobility often associated with borders - be these fences, drones or water - is the bureaucratic regime of visas.

Research into standards, practices and bureaucracy may not seem like a pressing political intervention in the UK when there are epistemic threats to the lives of refugees: the harsh rhetoric on migration and the continual surveillance of refugees and the loss of lives at the border (Pawson & Thibos, 2024). Similarly, the Home Office's immigration tactics, as El-Enany (2020) and Yeo (2020) argue, are informed and perpetuate racialised norms of exclusion politics. We may exclude the space of visa applications as secondary to the more visible forms of discrimination around us. I justify the need for intervention in the space of visa politics and technology due to the narrative of normalisation both entities carry. What I mean by this is that the division, rank and hierarchies of mobilities based on the nationality of individuals have become a standardised practice by states (Andrijasevic & Haddad, 2010). My research reveals the administrative technologies of the Home Office and uncovers how the infrastructure of the border is technically poised to replicate and reinforce past migration patterns. By examining the technical infrastructure of the Home Office this thesis interrupts the narrative that the use of technology makes UK migration fairer, more efficient and equitable and identifies how digital systems have become encoded to perpetuate a Hostile Environment. The proliferation of

technology within government agencies has become an accepted practice to improve public governance's quality, efficiency and cost-effectiveness. I provide an insight into how the technical aspects of three technologies the Home Office uses to make decisions and manage and process migration in and beyond the UK, reveals the proliferation of a *Digital* Hostile Environment.

My definition of the *Digital* Hostile Environment encapsulates how the perpetration of internalised border checks and insecurity of immigration status are supported by technological systems. My research exposes the longevity of the Hostile Environment policies to make the UK an unliveable place for people with insecure status to live in – through the technologies used to manage the administrative features of the Home Office. I build on the work that critiques the use of technologies to track, surveil and govern migrants throughout public life in the education, health, benefits, employment and housing sectors (Coddington, 2021; Donà, 2021; Griffiths & Yeo, 2021). Digital technologies facilitating UK border policies must be considered as more than the vehicles for how the practices are enacted. Technology has long been applied to the border, in the form of name registers in books in Ellis Island (Leurs & Seuferling, 2022) or landing cards for those arriving at the ports of Dover. Attention is often given to the hi-tech solutions applied at the border, the drones surveilling the seas for small boats (Ghaffary, 2020), facial recognition systems and the robot dogs at the US border (Villa-Nicholas, 2023).

I am aligned with the research on the impact of low-tech (Bonelli & Ragazzi, 2014; Canzutti & Tazzioli, 2023) on the management of migrants. Low-tech as conceived by Bonelli and Ragazzi (2014) is a "heuristic device to denote the combination of relatively simple modalities of data collection, storage and dissemination" (p.480) that shape how security practices operate. I build on the distinction between high/low tech to depict the tools explored in this thesis. Though some methods may not be technically advanced, yet contribute to the standards, practices and infrastructure of border decision making. The back-end of the border, meaning tools that are used by the Home Office and other departments to support decision making, are designed as heuristic devices to reduce the mental excursion, time and amount of Home Office labour for managing migration. By understanding the sophistication of these tools as minimal, or low tech, helps the reader stay grounded in the continuity facilitated by the technologies—that is, the algorithms and databases designed and maintained to perpetuate past migration patterns. For when we connect how devices assist Home Office caseworkers to make

decisions, it becomes clear that they are calibrated toward certain biases'. The Sham Marriage algorithm, assisting a Home Office caseworker to dictate if a marriage between two people is fraudulent, is technically calibrated to embedded past social bias in the assessment the mediation between technology and borders becomes clarified. The administrative technologies mediating between the Home Office, migrants and governance are embedded with technical features that are poised to reproduce racialised results.

The back-end and low-tech solutions to these issues are important to investigate because, in its everyday use, technology and migration governance may never fully be transparent to those applying. Furthermore, if these continue to be obscured, they stay invisible for those who are working and researching the back-end systems. The tangible technologies of an ankle monitor, fingerprint scanner, e-passport gate and biometric upload apps are features of the front-end of border technology. Even the data-sharing agreements, in a sense, are front-end capabilities as civic actors made visible the possibility of exchanges of data. Behind the acknowledgement that there is data sharing between the Home Office and actors, there is the technical capability to make this information tractable (D'Ignazio & Klein, 2020, p. 103). We know that there is data sharing, the dispersal of borders, and the implementation of algorithms to help manage visa applications. However, I ask *how* these border tools work and what kind of technical infrastructure is being built? I ask *why* is it important to consider how features of the visa and migration governance are being managed by technical and administrative systems?

I argue that understanding how visas and migration data are being administered reveals how the Hostile Environment's desire to produce exclusionary politics are ingrained into the technical infrastructure of the Home Office. Administrative technology as a focus expands the academic consideration for the *Digital* Hostile Environment as these tools do not facilitate the data sharing abilities, but are at the forefront of persons' abilities to visit, live and settle in the UK. By expanding the exploration of the digital features of bordering practices for the Home Office to manage external visas, internal belonging through marriage application, and the process of case working, there can be an examination of how the core features of technical infrastructure are poised to reinforce and replicate past migration patterns. Chapters Four, Five and Six uncover how the construction of the tools is poised to reinforce racialised outcomes. In Chapters Seven and Eight, the second half of my thesis, I hypothesise how the pattern of using private contractors contributes to the ability of the Home Office to export accountability and

responsibility onto other actors if there are issues with the administrative features of the border. In the chaos of the technically opaque relationship between digital technologies, the Home Office and migrants, we begin to see the transformation of the border into a Möbius strip (Bigo, 2001). When we peer into the *Digital* Hostile Environment, we cannot discern where the boundaries of the internal/external border begin and end, nor how future populations will be harmed by technological systems. My research considers how the technology being built today shapes how the future of bordering will be enacted tomorrow.

Over the three years of researching the *Digital* Hostile Environment, I grappled with the "so what" aspect of my work. How do I avoid a tautological argument about the bias in the Home Office's digital infrastructure? To validate the "so what" of my research I reflect on the question I was asked during my upgrade review. That if the attitude, policies and mentality of the UK government changed, from a Conservative to the Labour Party, then the impact of my research would deteriorate. However, the administrative technology of the Home Office is technically poised to reinforce and replicate migration patterns from the past, and would continue to do so despite the change of attitude towards migration. For we could hypothesise that a new government may scrap more visibly exclusionary policies, but the redesign of a caseworking system, CID, has taken six years, and in the process has resulted in the mismanagement of data and continues to have system failures. I note the infrastructurally laborious and often chaotic task of redesigning technical feature to reiterate that technologies are more than vehicles *for* policy; they are drivers of standards and practices shaping the border. An analogy to illustrate my point would be if a government with a different attitude came into power the changes to the Home Office would be comparable with a paint job to the exterior of the building. The tools that I explore would mean the foundations of the building would need to be redesigned to root out bias in migration governance. The 'so what' of my research is to identify how the portions of 'foundations' of migration governance inform the shape, form and power of the border through maintaining racial bias in the administrative technologies of the Home Office.

My research demonstrates that due to the networked nature of the tools and the increasing use of private actors, the Home Office makes the notion that a more compassionate government would be able to 'fix' the technology that is in practice difficult to implement. By revealing the reliance and pattern of using technology in the administrative features of migration governance, technical systems are not simply instruments *for* policy, but contribute to the organisation and

infrastructure of the *Digital* Hostile Environment. As I focus on less flashy, often mundane, technology, I contribute to discussing how technology, power and borders intersect. Star-Leigh (1999) called attention to the study of 'boring' things like practices, information technology systems and standards as a crucial intervention into how power is organised and enacted. By investigating the 'boring' technical infrastructure, my research contributes to new empirical data on how the *Digital* Hostile Environment has spread to the Home Office's administrative technological solutions.

My contribution to critical border studies is to reveal how the introduction and facilitation of migration governance are poised to reinforce discriminatory outcomes. On the surface there have been other scholars who have examined how technologies have shaped borders (Aas, 2006; Amoore, 2006, 2009, 2021; Dijstelbloem & Meijer, 2011; Sontowski, 2018) and critical race scholars who reveal how digital tools are poised to reinforce discriminatory outcomes (Benjamin, 2020; Broussard, 2019, 2023; Browne, 2015; D'Ignazio & Klein, 2020; Eubanks, 2018) . There has been work in civil society to consider the harms of data sharing between the Home Office and other border actors, creating a *Digital* Hostile Environment (Foxglove, Liberty, et al., 2021). My contribution is to incorporate the critical border and data studies literature to shed light on how the ethos, goals and desires of the Hostile Environment policies have become digitally codified and embedded into migration governance.

1. 1 Hostile Environment:

What does hostile mean? As an adjective, hostile is "the nature or disposition of an enemy; unfriendly" (Oxford English Dictionary, 2024). Figuratively, hostility refers to "unfriendly in feeling, action, nature, or character; contrary, adverse, antagonistic" (Oxford English Dictionary, 2024,p. 4). The etymology of hostile captures how the Home Office's policy to spread border checks throughout the UK intensified the disposition of the unfriendliness, adverse and agnostic nature of immigration. I use the term ethos to describe how the aim of the Hostile Environment extends past the migration outcomes and cultivates a spirit, characteristic and feeling of hostility as a tool to control borders beyond the external boundaries. Theresa May, then Home Secretary, stated that the aim of the Home Office is to create a 'really hostile

environment for illegal[1] immigrants' (quoted by Hill, 2017). From this infamous quote, the Hostile Environment in the UK began to spread. What emerged from this 2012 declaration was that a really hostile place for migrants became a dispersed patchwork of standards to turn border controls inward throughout the UK. Before I provide an in-depth overview of the origins, particularly the dispersal of border control and the Windrush Scandal, it is important to note my decision to continue to use the phrase Hostile Environment throughout the thesis. In 2018, after the Windrush Scandal, the Home Office attempted to rebrand the Hostile Environment as the 'Compliant Environment' (Qureshi, et al., 2021; Wemyss, 2018). In response to the review by Williams (2020) the Home Office stated that there would be a review of the policies, and the attitude would turn from Hostile to a Compliant Environment. Aligned with activist groups, I do not recognise a disjuncture from the rhetoric change, instead perceiving ongoing legacy and deployment of the 'Hostile Environment' as embedded in the infrastructure of the Home Office.

What I mean by the ethos of the Hostile Environment is an effort by the UK by cultivating a place of fear, instability, and chaos for migrants, to establish a culture that seeks an increase of "voluntary returns" and a deterrence for migrants overall. The goal of the Hostile Environment is not reflected in the results; there has been an increase in arrivals since 2014 and a decrease in the "voluntary deportations"(Qureshi, et al., 2020). The continual failure of the spread of border control to public spaces to deter migration into the UK leaves open the question: What is truly the objective of the Home Office? For we can hypothesise, as Yuval- Davis, Wemyss and Cassidy (2018) have, the objective of the Hostile Environment is a "hegemonic governance technology for controlling diversity and discourses of diversity, often using both securitisation and racialised discourses of belonging" (p.17). To understand the transformation and embeddedness of the Hostile Environment I now provide an overview of the origins of the Hostile Environment.

[1] The use of illegal here should not be seen as legitimising the apparatus of illegalisation of migrants. I recognise that the categorisation of "illegal" people is part of the legacy of exclusionary politics. Aligned with De Genova (2013) I see the process of illegalisation as a historical technology that has been deployed to control migration.

1.1.1 Origins:

While the Conservative government is associated with the start of the Hostile Environment, the practice of internalising border control began in the early 2000's under the Labour Government. Griffiths and Yeo (2021) note the Labour government introduced a series of checks, mainly in higher education and cross-departmental "criminal" agencies to create an "uncomfortable Environment" for migrants. Labour enacted in 2006 the *Immigration, Asylum and Nationality Act 2006* which introduced fines for employers for employing individuals who do not have status in the UK. The internal practices of othering migrants are not 'new' and have longer legacies of exclusionary politics. Goodfellow (2020) articulates the origins of the Hostile Environment as the:

> concerted efforts to limit the number of people of colour entering the UK: at its core, the nation's history on immigration legislation is a history of racism. It's in this context that the Conservative's 'hostile environment' policies can be seen for what they are – not a deviation from the norm, but well aligned with the UK's approach to race and immigration over several decades (p. 68)

As Goodfellow (2020) notes, the ontological framing of the Hostile Environment is a continuation of racialised border politics. I build on this framing to tease out how the weaponisation of access to the state benefits poses threats for migrants. Under the Conservative government, immigration checks began to spread to other parts of the UK. The Immigration Acts of 2014 and 2016 are noted to be the biggest codified components of the Hostile Environment. Griffiths and Yeo (2021) state that the Hostile Environment does not have a "White Paper" [2] but still became the cultural and political mindset for migration governance. From these two acts, the dispersal of border control began by asking public citizens, public institutions and private actors to become agents of migration governance.

1.1.2 Dispersal of Border Control

As the Hostile Environment aims at cutting irregular migrants from accessing the state or settling in the UK, the Home Office created means to extend the tentacles of the border into the

[2] "White papers are policy documents produced by the Government that set out their proposals for future legislation. White Papers are often published as Command Papers and may include a draft version of a Bill that is being planned. This provides a basis for further consultation and discussion with interested or affected groups and allows final changes to be made before a Bill is formally presented to Parliament" (UK Parliament, 2024).

public life of all citizens. Immigration status checks are now legally mandated to all wishing to access employment, housing (in England), and education. Critics of the Hostile Environment were early to note that the spread of checks to public citizens, employers and landlords would have an increased risk for citizens who "looked foreign" (Liberty, 2019a). Penalties for employers have existed since 1999 and have increased from charges of £3,000 to now, as introduced in the 2016 Immigration Act, a fee and possible prison sentence of three to five years (Home Office, 2016b). Similarly, private landlords were transformed into border control officers in the 2014 Immigration Act (Home Office, 2014a). Landlords were asked to "obtain and copy documents demonstrating an individual's right to rent in the UK, such as a passport or biometric residence permit. In most cases, there will be no need for landlords to contact the Home Office" (Home Office, 2014, p.6). Dissemination of border controls to private landlords with no direct oversight from the Home Office works to transform "every street" into a border (Keenan, 2019). The Joint Council for the Welfare of Immigrants (JCWI) and Liberty challenged the 'right to rent' scheme as their research demonstrated that private landlords were disproportionately checking and rejecting housing applications of minority groups (*The Secretary of State for the Home Department v R (on the application of) Joint Council for The Welfare of Immigrants*, 2020). After the challenge and ruling by the High Court, the practice of checking immigration status in the private housing sphere was deemed a violation of human rights. Even under the 'rebranding' of the Compliant Environment, there is still the recommendation of the Home Office for private landlords to check immigration status. Now, there is a digital portal to help landlords and employers simplify the process. As we have just covered, beyond the space of private citizens, borders were spread through governance institutions like education.

Borders in education systems first appeared under the Labour Government in 2008, as Higher Education institutions were asked to track the attendance of international systems. The ability of universities to sponsor international students became regulated by the Home Office through audits of attendance records of international students. The Department of Education(DfE) signed a Memorandum of Understanding (MoU) with the Home Office to share the data of "1,000 children every month", including students' nationality and date of birth (Gayle, 2016). The formal arrangement of the MoU between the DfE and the Home Office ended in 2019 (Liberty, 2019b). Another MoU was signed between the Home Office and the National Health Service (NHS) in 2016, introducing data sharing on foreign patients. Like the spread of

border checks to landlords and employers, healthcare professionals were now required to ask patients for proof of their status in the UK before or after receiving medical assistance. The data sharing agreements between the Home Office and NHS perpetuated fear for people with insecure statuses to seek medical help (Huws, 2020). The dispersal of borders into the everyday fabric of the UK has been fiercely contested, and the narrative of the Hostile Environment is nonlinear. To further illustrate the racialised harms of the Hostile Environment I, now provide an overview of the Windrush Scandal.

1.1.3 Windrush Scandal

One of the major consequences of the Hostile Environment is the Windrush Scandal. The Windrush Generation refers to the Commonwealth citizens who came to the UK, primarily from the West Indies (Reddie, 2020) after WWII. The name is linked to the HMS Empire Windrush ship that toured the Caribbean recruiting workers to come help rebuild the UK in the aftermath of WWII in 1948. At the time, all arrivals had equal rights to live and work in the UK under the British Nationality Act of 1948 (Goring et al., 2020). The children of the Windrush Generation, many of whom followed their parents to the UK and arrived before the 1973 Nationality Act, lived in the UK with full rights to live, work and settle. Hostility followed the Windrush Generation throughout the UK and affected the community's ability to access housing, social life, employment and welfare access (Gentleman, 2019). The labour shortage from WWII and the creation of the NHS began to rely on Commonwealth citizens, and the public continued to ostracise the community (Kyriakides & Virdee, 2003). Then, the reforms in 1971 and 1973 changed the status of Commonwealth citizens from "British subjects" to "ordinary residents with indefinite leave to remain." The history of legally changing the status of individuals from equal rights to reside to more restrictive and opaque rules on citizenship left thousands with insecure status without their knowledge. What is now referred to as the Windrush Scandal is the Home Office retroactively targeting individuals for 'voluntary deportations' if they could not prove their immigration status. In practice, the population affected included the children who followed their parents before 1973 and many who were left without their childhood passports, landing cards, or tickets from decades ago. This population of citizens began to be targeted for voluntary return by the Home Office. The practice of the Home Office stripping UK citizens of their rights shows the dangers of bordering controls being spread beyond the external boundaries of a state.

The Windrush Scandal began to be reported in late 2017 by Gentleman (2019), telling the story of Paulette Wilson who, after living in the UK for 50 years, was informed by the Home Office that she was an "illegal" immigrant. Stories like Wilson's began to be uncovered and reported by UK newspapers about people who could no longer 'prove' their status in a country they had lived in for decades. Under the Hostile Environment, the victims of the Windrush Scandal found themselves cut off from benefits, government housing, employment and pensions (Gentleman, 2019). Even though those affected by the Windrush Scandal could provide extensive records of their lives in the UK, GP records, tax returns, school records and employment slips, the Home Office continued to say there was "no trace" of them (Williams, 2020, p. 29). The health and monetary repercussions of the individuals who were retroactively classified as 'illegal' is impossible to encapsulate in this thesis alone. As the Windrush Review is still underway, the estimated victims are near to 15,000, with only 5% having received compensation for the injustice perpetrated against them (Williams, 2020). In the aftermath of the Windrush Scandal, civil society has pushed for the Home Office to recognise the "institutional racism" (Gentleman, 2019) that drove the Hostile Environment policies and mentality that resulted in the stripping of citizenship rights of the Caribbean community. Williams (2020) reports in her review of the events leading to the Windrush Scandal:

> While I am unable to make a definitive finding of institutional racism within the department, I have serious concerns that these failings demonstrate an institutional ignorance and thoughtlessness towards the issue of race and the history of the Windrush generation within the department, which are consistent with some elements of the definition of institutional racism (p.7).

William's (2020) claim that ignorance and thoughtlessness contributed to elements of institutional racism clarifies how the ethos of the entire practice of spreading and deputising[3] borders under the Hostile Environment needs to be considered. A helpful framework to understand the mentality of the Home Office is that there is a thoughtful production of ignorance that can then be used to shield the department when there are injustices perpetuated. An example of this framework is the knowledge of the Home Office that the Caribbean community in the UK may not have proof of their status, but they were legal residents of the UK (Atkins, 2023). With

[3] I use this 'deputisation' as defined by Griffiths and Yeo (2021) "to describe the co-opting of organisations and people as de facto immigration officers" (p. 523).

the knowledge that there would be harm to certain communities, the Home Office began to target individuals retroactively for their immigration status.

Through a whistle-blower from the Home Office, Gentleman (2019) shows that the purposeful destruction of physical landing cards intensified the difficulty of Windrush victims in "proving" their status as citizens. Mismanagement of data and records by the Home Office whilst the department was actively pursuing retroactive data practices forms a significant contention in how technology legitimises these practices. After destroying physical landing cards, the Home Office argues that digitalising status and records will ensure that similar mismanagement does not occur. This turn to the digitalisation of migration is what this thesis identifies as informing the continuation of the Hostile Environment. For Goodfellow (2020), the focus on technology was the tools used to produce anxiety, fear and isolation in the Windrush victims and ethnic minority communities. Two examples of technology used to spread fear towards racialised populations are the text messages sent to victims informing them they no longer had the right to live in the UK and the vans driven under Operation Vanken[4] into racially diverse neighbourhoods in London (Goodfellow, 2020). I build upon the findings of Gentleman (2019) and Goodfellow (2020) by considering how the legacies of racialised hostility have become exported onto digital technologies. What is left to explore is how technology is used by the Home Office to "solve" the racialised outcomes of the Hostile Environment; as I explore in my thesis, technological solutionism reinforces biased migration outcomes. Another key policy feature that shaped the digital transformation was the UK's vote to leave the EU regulation in 2016.

1.2 Brexit

Brexit, the common name for the decision of the UK to leave the European Union (EU), began in 2016 and was finalised in 2021. This decision to leave the EU regulations impacted migration both internationally and locally. Internationally, the UK left the EU regulations on data sharing on asylum seekers under the Dublin Convention. There would need to be new agreements drawn with EU member states on the management and governance of asylum

[4] Operation Vanken is the name given to the Home Office pilot which "between 22 July and 22 August 2013 in six London boroughs to test whether different communications could encourage any increases in voluntary departures. It included several communications techniques, such as mobile billboards highlighting the risk of arrest, postcards in shop windows, adverts in newspapers and magazines, leaflets and posters advertising immigration surgeries in faith/charity group buildings" (Harper, 2013)

seekers. Campaigns for Brexit utilised xenophobic tropes to encourage British voters to leave the EU (Pickup et al., 2021). After the referendum, and the exit of EU regulations, the UK government was faced with a major policy challenge: how to process and govern the European Economic Area (EAA) citizens that were living in the UK, without the freedom of movement this population now required official status.

Any EAA citizen who resided in the UK before the 31st of December 2020 had until the 30th of June to apply for permanent settlement status. The UK government proposed an automated decision-making scheme to assist with processing the EAA citizens who now had to apply for pre-and/or settled status. As the immigration rules changed for the EAA population within the UK, one of the main rules applied for application for the settlement scheme was proof of "continuous residence" in the UK (Maxwell & Tomlinson, 2022). From the rollout of the EU resettlement, the datafied harms emerging in the Hostile Environment became clarified.

1.2.1 EU Resettlement Scheme

New questions of who belonged began to emerge as the UK government reconsidered immigration rules to control the existing EU community in the UK. How does the government ensure that every person who needs to apply for the resettlement scheme is aware of the new process, capable of making the application and has access to the technology to fill out the application? Under pressure to ensure that there was not another 'Windrush Scandal', civil actors pressured the government to maintain transparency in the decision-making processes of the resettlement scheme. To process the three million applications from EAA residents, the Home Office proposed digital technologies to host the visa portal and automate matching application aspects, called the EU Settlement Scheme (EUSS). In practice, the automated process of the EU Resettlement Scheme matched the applicants' records with those of other governmental agencies to confirm the length of time a person has lived in the UK. One of the main factors for an applicant's success was proof that they had continuously lived in the UK, and the Home Office used records from Her Majesty Revenue and Customs (HMRC) and the Department of Work and Pension (DWP).

The millions of EU citizens who went through the automated and digital system with ease can be contrasted with those who faced challenges using the system. This illuminates how recasting the categories of belonging perpetuate historical racialised biases. The introduction of

data matching to assist in the process checked if there were five continuous years of residency, or less for "pre-settled status", based on automated data matching with the HMRC and the DWP. Consequently, this process introduces how data quality can affect the outcomes. The EU resettlement process directs attention to how the system marked the pattern of rolling out digital systems that may work for the many; but more vulnerable people may be negatively affected.

Jablonowski (2023b) discusses the glitches and malfunctions of the EUSS and Yong uses an intersectional legal approach to problematise the EUSS for the 8% of unsuccessful cases. Yong (2023) argues that the EUSS places immigrant women at a disadvantage and thus contributes to an ongoing investigation into how different protected characteristics (class, age, race, gender, religion and sexuality) of individuals inform how border policy affects their lives. The findings of the EUSS and the work on the Hostile Environment pattern illustrate the continuous reinstating and redrawing of borders internally. As the Hostile Environment introduced the ethos of "assume illegal unless prove(n) otherwise" (York, 2018). One of the original contentions from activist groups was the instability of having the EUSS receivers having a digitally-only status. This is a departure from the previous practice of giving physical cards to visa holders, such as biometric cards, to prove immigration status. Instead, the Home Office decided the EU resettlement scheme applicants would be given their status on a digital system and that they could use an online portal to prove their ability to work, live and receive care in the UK. Issues arise from the ontological fragility of databases, computer systems and records mismanagement. The combination of assumption of illegality for certain populations (Yong, 2018) with the provision of a digital status, on error prone technological systems, epitomises the risks of the *Digital* Hostile Environment. Behind the fallacy that technology can 'solve' social dilemmas, like migration issues, I begin the exploration of how technologies introduce continuity of border relations rather than increased equity. Broussard (2019) coins the terms "technochauvinism" to describe the false perception that the "math embedded in (computer) code are somehow better or more just for solving social problems" (p.156). In the context of the Hostile Environment the Home Office belief and action to use technology to avoid the past harms of their retroactive bordering practice, mainly the Windrush Scandal, epitomises a technochauvinism attitude. Emerging from the adoption and reliance of technology is a continuation of the Hostile Environment policies that have been 'uploaded' into the digital system.

1.3 The *Digital* Hostile Environment

Considerations for the *Digital* Hostile Environment began first with the recognition that the sharing of data contributed to the aforementioned 'deputisation' (Griffiths & Yeo, 2021) of the border and the intensification of technology to assist in the governance of migrants. Foxglove, the JCWI and Liberty (2021) critique the data sharing between the governmental departments to remove individuals from the UK. The experimentation of moving immigration status to a digital system begins to form a patchwork network that results in an increase in the ability to facilitate the ethos of the Hostile Environment. Non-academic groups have primarily criticised the emerging digitisation of Hostile Environment (Foxglove, Liberty, et al., 2021). In this thesis, I contribute academic concern of the implementation of Hostile Environment to consider how the back-end systems of the Home Office are operationally poised to reinforce, replicate and invisibilise the harms of spreading border control.

A dominant critique of the Hostile Environment is the practice of exporting border controls into the public health sector. Uthayakumar-Cumarasamy (2020) argues that the involvement of the NHS has become a centre point for the weaponisation of the welfare state and perpetuates harm towards minority communities (Donà, 2021; El-Enany, 2020). Coddington's (2021) work exemplifies the intersection of border and health service. It uses a data-feminist methodology to account for her experience of being a visa holder and being viewed as suspicious by NHS workers during her pregnancy in the UK. From her narrative-based argument, Coddington (2021) aligns with Uthayakumar-Cumarasamy (2020) and Donà (2020) to highlight the racialised and gendered consequences of Hostile Environment policies. The work on border control and the public health sectors offers a portal to see the reinforcement of oppressive structures in the nexus of health surveillance and immigration control. In this thesis's final chapter about the Americanisation of the *Digital* Hostile Environment, I draw on the debates around the validity and risks of placing border checks inside the NHS. There is an undercurrent of literature problematising how the data is circulated and managed in healthcare systems (Waterman et al., 2021).

Similar to the concerns of the Windrush Scandal and Gentlemen (2019), these practices are directed to detect "illegal" persons spilling over to make visible the marginalised

communities of UK citizens. From the academic and activist work done to critique the use of technology to share and store migrant data, I have built on the consideration of the use of digital administrative systems. My research contributes to an extended investigation into how the systems used to assist in risk assessing, managing and storing data are poised to reinforce past migration patterns. Technology and border control have historically been linked (Mushfequr Rahman, 2021) and have ranged in forms. The capability to correlate, shift and assess vast amounts of data is transformed through the development of digital information technology. Awareness of the data sharing practices, as discussed above, perpetuates fear and uncertainty for individuals within the UK, but there has been little attention to how the Home Office uses technology to organise its administrative practices. We know that the shift to and reliance on technology has perpetuated harm. My research, then, uncovers how the ability of individuals to move, settle and reside in the UK is being maintained and informed by technologies poised to reinforce harm. My case studies shed light on how the intersection of technology and bordering in the UK perpetuate biased decisions. I recast technology within the *Digital* Hostile Environment to consider how digital systems are both a vehicle *for* politics and a driver of practices. The structure of my thesis is as follows.

Chapter Two is my literature review; I contextualise my discussion on forming the *Digital* Hostile Environment within the literature of critical border studies. To understand the change to the shape, form and power of the UK, I engage with critical scholars who demonstrate that borders are no longer territorially bound at the exterior of states but rather appear in ambiguous spaces within society (Balibar & Williams, 2002; Van Houtum & Van Naerssen, 2002). As we begin to understand borders not as fixed and static entities but composed of dispersed series of practices, standards, actors and technological devices, my discussion on the UK *Digital* Hostile Environment becomes more grounded in the larger contextual framework. I use International Political Sociology (IPS) as an analytical framework to understand both the social and technical aspects of bordering. As my empirical research focuses on the administrative technologies used by the Home Office to assist in decision making processes, IPS helps ground the literature on why the governance of borders can speak to the new topology of power emerging in internal/external spaces. Based on Bigo's (2001) appreciation of the mathematical figure of the Mobius ribbon, an object like the internal/external boundary becomes less clear to the viewer. I conceive that the proliferation of digital technologies to maintain the Hostile

Environment has transformed the UK into the notion of Mobius ribbon. From my grounding in IPS as an analytical framework, I explore how critical infrastructure studies and data studies can be used to capture the embedded bias in border technologies.

While we may understand the influence of the technologies used at the border, how do we frame the importance of digital systems? I draw on critical infrastructure scholars, like (Dijstelbloem, 2021) to see how borders in practice are maintained through a patchwork system of procedures, technologies and actors. The work of critical infrastructures considers that fluidity and changing nature of categorical power of borders, that is to say, the primary purpose of borders is to be a sorting apparatus of mobility (Andersson, 2014). To identify the embedded nature of categorical power at the border, critical infrastructure draws on how information systems are used in administrative settings to codify and, therefore, legitimise the categories that determine how visible people are made to state actors. My ultimate contribution to border studies comes from a rich introspection of how administrative technologies reinforce past migration patterns with new technical efficiency and adaptability.

Chapter Three covers the methodology for this thesis. I use various methods to explore the proliferation of digital technologies in UK administrative systems. My methods chapter explores how the critical constructivist epistemological framework informs my research. From a critical constructivist lens, I define the key terms of race, gender and discrimination. I ground my methodology principles of data feminism (D'Ignazio & Klein, 2020) as a means to combine the ontological problematisation of critical data studies with my work on technology so as not to reinforce biased knowledge production. I combine semi-structured interviews with experts with original desk research to uncover how the technologies I explore in my case studies operate. I do not collect data from migrant populations as the technologies I explore operate without the overt knowledge of applicants. My ethical approval for the interview was approved, as the risk of re-traumatising, endangering or harming my participants was low because all the professionals I interviewed are embedded into practices of resisting or researching digital borders.

In Chapter Four, I introduce the first empirical chapter focused on an automated decision tool that the Home Office used to risk assess visa applications. The Streaming Tool would filter applications for Home Office workers using a red, amber, and green scale. The JCWI and Foxglove filed a statement to gain more information on the Streaming Tool based on suspicion that the algorithm used nationality in the risk assessment process. From the grounds that the tool

operated in a discriminatory manner, I work to identify how the Streaming Tool needs to be considered not as a standalone product but as part of a networked system. In this chapter, I introduce how the infrastructure lens captures how algorithms within the administrative mechanism must be connected to the social and technical networked features of bordering practices. In this chapter, we begin to demystify that algorithms and automated decision-making schemes are components of efficient and often invisibly reinforcing the past biased social patterns of bordering practices. Even with the redesign of the Streaming Tool to no longer use nationality as a *direct* input, there can still be discriminatory features.

Chapter Five explores The Sham Marriage Tool, a risk assessment algorithm used by the Home Office to determine the likelihood a couple is entering a 'fraudulent' relationship for the immigration purposes. Like the Streaming Tool, the Sham Marriage algorithm uses a red, amber, and green system to rank applications on their likelihood of being fraudulent. Unlike the Streaming Tool, the Sham Marriage algorithm has produced racialised outcomes from the tool *without* the direct input of race. The Public Law Project (PLP) has filed for more information about what factors the Sham Marriage algorithm uses to produce a risk rating. From initial reports, nationalities disproportionately rated red by the Sham Marriage Algorithm are at 25 per cent higher for " Bulgarian, Greek, Romanian, and Albanian (Public Law Project, 2023b). This chapter reinforces the arguments that automated bias does not only emerge from the direct consideration of nationality but can be brought forth from indirect inputs of data. I continue my exploration of the harms of automation with my final case study, Atlas.

Chapter Six examines Atlas and explores the case working system the Home Office uses to manage migration data. Unlike the other two case studies that covered risk assessment algorithms, the one on Atlas uncovers how automation has become embedded into the case working database. I build on the findings of the previous chapters- that automation can streamline and make more efficient the production of racialised outcomes - to problematise embedded nature of automation in the case working system. When I began researching Atlas, there were no codified discriminatory outcomes, like the Streaming and Sham Marriage algorithm which disproportionality red risk access certain nationals. Two months before submission, the *Guardian* uncovered that there had been mismanagement of visa holders' data, resulting in their inability to prove their status in the UK (Taylor & Dyer, 2024). As the newly codified harms affect vulnerable individuals through insecure immigration status, this chapter

shows how the development and deployment of this system demonstrate the technological benevolence of the Home Office. My interrogation of Atlas demonstrates that there can be critiques of technologies *before* there are codified harms through an infrastructural and critical data lens to contextualise border technologies. Atlas is the final case study that I discuss in the thesis. The second half of my thesis discusses the larger theme of private actors contributing to border technology.

Chapter Seven features a discussion on how private actors are present in all three of the case studies. I consider how private actors impact the development and deployment of border technology in three areas: (1) the adaptability of the technology, (2) accountability and (3) the reliance of the Home Office on private systems. I explore how the use of private software like Microsoft products facilitated the ability of the Home Office to add more automation to the replacement Streaming Tool. I identify how the technologies said to be "produced in house", like the Streaming and Sham Marriage Tool, are infrastructurally dependent on private software or are produced by a subsection of the Home Office primarily constructed of contractors. Based on contract analysis, I identify how Atlas demonstrates the intensification of the pattern of outsourcing the accountability of the function and maintenance to private actors. The first theme of adaptability emerges in the discussion of Atlas in the context of using Cloud database storage. From the discussion of the use of cloud computing, I set up the final consideration for how private actors are shaping the *Digital* Hostile Environment by identifying the Americanisation of the UK border technology.

My final chapter invites the reader to consider that the emerging pattern in the *Digital* Hostile Environment is the Americanisation of border technology. I trace how the American data company Palantir's involvement in the NHS demonstrates the contagious nature of border technologies. This chapter reminds us of the context and contribution of the Hostile Environment to spread border control internally in the UK, relying on digital technology. What I argue is at stake is how the tools used in the back-end of bordering systems may not appear to be as contentious as other technologies of control, i.e. the drones or GPS tracking of asylum seekers; but if we do not consider how the infrastructure of the new digital border is continuously relying on and outsourcing responsibility for the border checks internally and externally in the UK, the technical embeddedness of the tools are poised to reinforce and replicate social bias. The final

chapter sets up how further research into the backend systems of the Home Office can build on my findings of the private actors to further investigate the *Digital* Hostile Environment.

Chapter Two: Literature Review

As Chapter One identifies I am curious about how the practice of internalising border checks, via the Hostile Environment, are maintained by technological systems. To expand the academic conception of the *Digital* Hostile Environment I explore how the administrative technologies of the Home Office are contributing to the perpetuation of exclusionary politics. I combine critical border, data and infrastructure studies to support my research objective to explore how border technology reinforces and replicates discriminatory migration governance practices. I am conducting this research to reveal the role of technology in forming a *Digital* Hostile Environment. I propose that embedded into the tools used to fulfil border practices are racialised logics, and I reject the idea that technology is a politically neutral entity. My investigation of the *Digital* Hostile Environment addresses two main questions: (1) How is digital technology shaping the governance of borders in the UK? (2) What is at risk due to the role of technology in the proliferation of the Hostile Environment? To further illustrate the formation of the *Digital* Hostile Environment, I turn to literature that captures the border's inherent power to categorise subjects and create hierarchies of mobility.

I build on critical border studies literature by combining the theories of critical infrastructure and data studies. The first section of this chapter examines the power of the border without an emphasis on technological features, hi-tech solutions like biometric databases and algorithmic systems; the second section builds on how emerging technology exacerbates features of the border. I begin with a grounding in how the border is defined. I focus on the branch of critical border studies, as it provides a framing to view the practices, standards and actors maintaining the border as relevant academic inquiries. International political sociology (IPS) provides a crucial analytical framework to support how I engage with the breadth of border studies literature. I draw from IPS to ground why and how practices and standards at the border shape both the operational power and the role of non-state actors in migration governance. To frame the changing shape and form of the UK border, I draw on the IPS concept of a Möbius strip to conceptualise the increasingly blurred boundaries between internal/external features of migration governance (Bigo, 2000, 2001; Bigo & Walker, 2007). Through critical infrastructure and data studies, I contribute to the empirical investigation of the blurring, shifting and changing technological and administrative border power. I propose an infrastructural framework to explore

the systems forming the *Digital* Hostile Environment - to highlight the embeddedness of racialised dynamics in technology and borders. I use critical data studies to inform the deconstruction of datafied systems in their application to border practices. From both these literatures I tease out the changing features of governance, and how by capturing technological bias and the infrastructural power of border technologies is in practice fulfilled. I argue that examining the UK border system from an infrastructural perspective breaks down the practices, assumptions, and design that perpetuates a *Digital* Hostile Environment.

2.1 Defining the Border

Migration literature is a dispersed field of study that draws on geography, sociology, anthropology, and criminology. De Genova (2013) claims that "if there were no borders, there would be no migrants—only mobility" (p. 253). De Genova (2013) uses three keywords - borders, migrants, and mobility - to link the varied considerations in migration studies. Migration is primarily defined as the movement of goods, people, and objects through sovereign territory, which is marked out by the notion of *the borde*r (Steinberg, 2009). For some, borders are still spaces defined by displays of sovereign power dictated via the right to live (Mbembe, 2019), whilst others view borders beyond notions of sovereignty as fluid social constructions that influence identity politics (Chouliaraki & Georgiou, 2022; Kolossov & Scott, 2013). Under the umbrella of critical migration studies, I focus on power relations emerging at the border. My inquiry into the emergence of the *Digital* Hostile Environment begins by considering approaches within critical migration studies to conceptualise the border.

Since the 20th century, there has been a more nuanced examination in academia of the entity we call the "border" (Chouliaraki & Georgiou, 2022; Fassin, 2011). As border studies increasingly argued that the metaphor of lines no longer served as a marking for borders, a new focus emerged on the stitching (Salter, 2012), weaving and intersecting practices governing migration. Border studies underwent a "renaissance" in the beginning of the 21st century to consider how borders are "socially constructed … managed… and impact our daily life practices in the newly created transition spaces and borderlands (frontier zones) which are in a constant state of flux" (Newman, 2006, p. 173). Varol and Soylemez (2018) identifies border "consciousness" as shifting from attention to the crossing of "lines on a map" to focusing on how

the "political boundaries (security check-points, passport controls, transit points) of borders and the regular crossing of borders, have become part of our routine experience" (p. 280). Borders are no longer merely geographical lines (Torpey, 1999) or lines of equal distribution of chances (Salter, 2006). Instead, borders are a series of technologies and procedures for filtering, ranking and hierarchising mobility (Andrijasevic & Haddad, 2010).

As border scholars work across disciplines-geography, sociology, international relations, and media and communications-the focus became on conceptualising the range of methods, practices, and standards transforming the border. Parker and Vaughan-Williams (2009) chart how critical border studies introduces a new epistemological, ontological, and conceptual framing of border politics. Critical border studies no longer considers borders as territorially bounded (Balibar & Swenson, 2004) or accepts the once widespread belief that there is a "borderless world" (Ohmae, 1990). Scholars have conceptualised borders as constructs that structure and shape identities of persons (A. Pelizza, 2020; van der Ploeg, 1999). Particularly, two historical events have been emphasised to dictate the role of borders: the end of the Cold War and the terror attacks pursued against America on September 11th, 2001 (Bigo & Guild, 2005a). The emphasis on the latter of the two events lends insight into the orientations of the critical border studies, identification that increasingly borders are "everywhere" (Paasi & Prokkola, 2008).

2.1.1 Border(ing) and Governance

The focus of critical border studies expanded from the metaphor of the line to the more concrete reality of an active process of "bordering" (Newman, 2003). Van Houtum and Van Naerssen (2002) call for a re-ontologistion of the border to capture the process that maintains territorial borders' power. By capturing the new spatial dynamics of the border power, van Houtum and colleagues (2005) argue there can be an understanding of the social processes that legitimises the exclusionary, "often violent", practices of the border and the reinspection of boundaries beyond demarcation of a line. The insistence that a border is a normative object does not suggest that the function of the apparatus does not have material consequences on individuals. Appreciations for the active processes, standards and means of categorisation capture the means of executing the innate exclusionary politics of borders. As Mbembé (2019)

argues, borders "are the name used to describe the organized violence that underpins both contemporary capitalism and our world order in general" (p. 99). As critical border studies began to view the active process of border control, the fracturing, spreading and dispersal of bordering logics, there is a balance to be struck in maintaining the understanding that borders do not affect persons equally.

To transform the analytical framework of borders as "active verbs" (van Houtum et al., 2005), rather than as nouns, captures the emerging unbounded topology of borders. Borders are not "everywhere"(Balibar & Williams, 2002) for everyone, but follows, ranks and surveils certain populations. Built upon the new ontological framing of the border as an active process, there is a further examination of how border control intersects with race relations. El-Enany (2020) uses the term "(b)ordering" to centre how race relations historically and presently inform the categorical power of belonging in the UK. Similarly, Yuval-Davis, Wemyss and Cassidy (2019) interpret the active process of border control as "rebordering" as a historical constructive practice that "delimits the boundaries of the state and the conditions of belonging to it" (p. 39). For Cassidy and colleagues (2018), bordering and border work are vital concepts to theorise the maintenance of the internal socially embedded process of "othering" present in UK treatment for Romanian migrants. Bialasiewicz (2012) argues that Europe's borderwork functions through various assemblages, actors and technologies. By identifying the externalisation of border management beyond the EU territory to Libya, borderwork supports Bialasiewicz (2012) claim that the process and experimentation of migration governance is enacted by various non-state and state actors. Rumford (2014) interpretation of borderwork captures how citizens are now components of controlling borders (either through contracts with the state or in the private sphere). Borderwork builds on the arguments that borders are active processes that emerge "throughout society, not just at the edge" (Rumford, 2014, p. 6). Bordering and borderwork are two concepts that embody the new direction of critical border studies and are useful for reorienting the focus of the border away from the external territorial boundary. This reorientation of borders beyond the territorial demarcation of sovereign boundaries supports my research objective to understand the governance of migration.

As my contribution to critical border studies is empirical research on administrative technologies, practices and standards that maintain the function of bordering, I rely on the work

of critical border studies to situate the importance of my empirical findings. Technologies for Yuval-Davis, Wemyss and Cassidy (2019) are best described as components of "firewall bordering" that are the conduits for filtering and maintaining the "governance of belonging in the UK" (64). Firewall bordering, Walters (2006) claims, is a political imaginary that combines the technical definition of a computer firewall (the control between the points of connection from a computer and a larger network) with the purpose of border technologies to control the "choke points of migration" (p. 152). I mirror Yuval-Davis, Wemyss and Cassidy (2019) in insisting that the governance of bordering is historically informed by practices of discerning, identifying, and categorising populations of persons. This must be accepted before there can be extensive consideration for how digital technology contributes to shaping the active border process. To illustrate the historical legacies present in bordering procedures, Yuval-Davis, Wemyss and Cassidy (2019) argue from "the beginning, these (border) controls classified people into categories such as being 'suspicious', being 'ill-intentioned', and 'lacking means' – that is, being without a job or a sponsor" (p. 38). Providing a historical overview of how border procedures and techniques have been transformed supports the claim that the contemporary means of bordering are not "inevitable" but part of determining notions of "belonging" for individuals (Yuval-Davis et al., 2019). I build on the findings of internalised bordering literature to frame my empirical focus on the maintenance of the *Digital* Hostile Environment, as I am curious about the administrative methods used to facilitate the technological inscription of the "everyday rebordering of belonging" (Yuval-Davis et al., 2018). Critical border studies consider the legislative barriers that uphold the inequality of persons' mobility. One of the framings of administrative practices of bordering has been maintaining the "paper border" (van Houtum & Bueno Lacy, 2020).

Unequal access to mobility and rights are not maintained solely through complex systems, like algorithms or data analytics, but through other forms of technical control. The development of technology to control borders must be contextualised in the historical tools that supported administrative practices. Passports became a formalised technology of border control during the First World War (Torpey, 1999), which transformed the nation's state ability to "monopolise the legitimate means of movement" (p. 3). As administrative practices advanced, "legitimate" movement became increasingly codified through other technologies, like visas or identity cards, in conjunction with creating "legitimate or illegal" passages of mobility. Visa

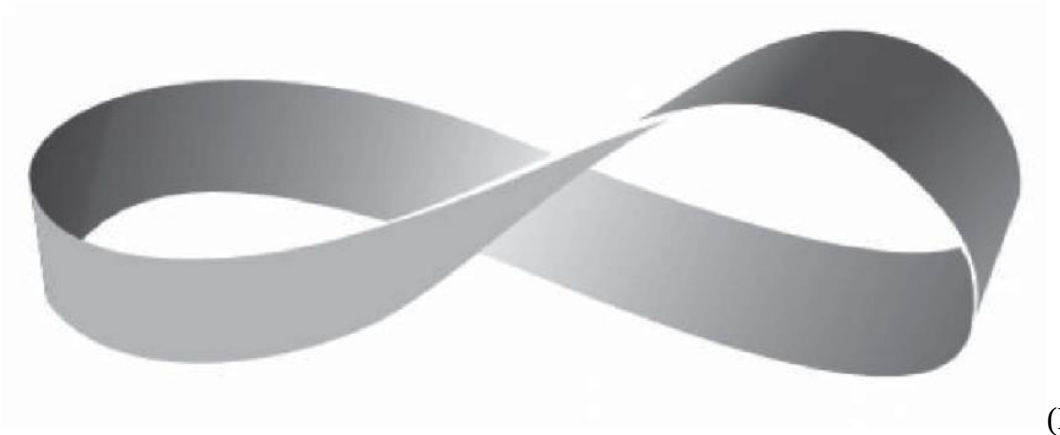
policies are referred to as the "lottery of birth" (Minca et al., 2022) or components of the "paper border" (van Houtum & Bueno Lacy, 2020), each term encompassing the inherent inequality baked into the system of nation-state borders. While materially less visually oppressive, compared to fences, walls or other border surveillant tools, paper borders are the main feature that decides ability, mode and mobility rights. Literature on visa regimes and administrative procedures that maintain hierarchies of mobility cover the increasing divide between the "global north and south" (Mau et al., 2015) and understand the racialised dynamics maintained by immigration policies (Salter, 2006). Powerful passports, those from the Global North, like the one I hold from the United States allow me to visit "188 countries visa free" (*United States of America*, 2024). This frictionless mobility (Scioldo, 2024) directed by the technology of the passport is a clear example of the unequal distributions within the border regime, or as Harpaz (2021) argues, produce status hierarchies. As established, the administrative processes of the border maintain the hierarchies of mobility. Metaphors or perceptions that borders are lines demarcation of external boundaries of sovereign states are no longer accepted by critical border studies, and attention has turned to understanding the maintenance, administration, policing and securing of the dispersed methods of the border. Critical border studies provide the basis for why we must consider borders as administrative, blurred and beyond territorial demarcation, but IPS introduces a cohesive analytical framework to conceptualise the impact of the increasingly dispersed scope of the border.

2.2 Theoretical and analytical framework: International Political Sociology

IPS is a useful project to frame and conceptualise the various actors, technologies and practices used to maintain the *Digital* Hostile Environment. Bigo and Walker (2007) conceptualise IPS as a "project, a collaborative endeavour" across disciplines with the goal of rethinking "entrenched boundaries, borders and categories" (p. 20). IPS developed from the discussion between three schools of international relations called, Aberystwyth, Copenhagen and Paris, which were criticised as "too constructivist" or not as academic as other international relations paradigms (Bigo, 2010). Huysmans and Pontes Nogueira (2016) describe IPS as "a signifier that connects people sharing a disposition toward traversing familiar, institutionalized repertoires of analysis" (p. 299). Based on the theories of Bourdieu and Foucault, IPS endeavours to reconsider and conceptualise the means of governance (Bigo & Walker, 2007).

Borders are the genesis object for the IPS project. Bigo and Walker (2007) argue border power can no longer be considered through the rigid boundaries of academic disciplines, particularly international relations and sociology. One of the early conceptions of Bigo and Walker (2007) is the metaphor of the Möbius ribbon, which helps explain the influence of internal policing on the eternal frontiers of borders. A mathematical figure, the Möbius strip or ribbon, is a loop in which the internal and external boundaries are not clear. See the figure below:

Figure 1: Möbius Strip



(Mirek, 2017)

Bigo (2001) claims:

> the metaphore of the Möbius ribbon which gives sense to the merging of the inside and the outside as well as it puts effective limits on the process of securitisation. It could be clear that what is at stake is not only the question of the physical border of the state but of the boundaries of understanding of the world. The frontiers between « inside and outside » are under discussion because we are on the limits of our political imagination (p. 3).

By tracing the fluidity of form and shape of the border, Bigo and Walker (2007) offer the figure of the Möbius ribbons to capture how individuals traversing borders cannot "know which face" of the border they are on, internal or external (p. 737). I build on Bigo's (2001) use of the

metaphor of the Möbius strip to focus not on the "securitisation of threat", but on how the practices of internalising the UK border relies on external actors, technology, private actors and technical systems. An invitation to rethink boundaries, lines and procedures relates to my empirical focus on transforming administrative processes.

A dominant theme in critical border studies, as explored above, is the insistence that borders are historically and presently assemblages for controlling and ranking the flows of persons crossing between spaces; from IPS and the analytical focus on smaller practices of security, the ability to unravel the complex governance of borders is clarified. Anderson (2013) and Squire (2012) thus consider the notion of illegality as produced and follows individuals beyond the external border practices. Anderson (2013) grapples with the history of the UK maintaining "an 'internal' racial homogeneity and the constitution and maintenance of whiteness" (p. 36). Anderson (2013) states, "immigration controls are not a neutral framework facilitating the sorting of individuals by intentions and identities into particular categories; rather, they produce status" (p. 161). Irregularity is the analytical framework for Squire's (2012) conceptualisation of borderzones; an emerging theme from this framework is the role of cultivation of risk. Risk categories and border practices have been theorised to connect to the production of illegality concerning mobility (Ploeg & Pridmore, 2016). Similarly, Ruppert's (2012) theory of internalised borders emphasises the discriminatory pattern of the intersection of everydayness, the production of irregularity and how this intersection impacts beyond the border. To illustrate the discriminatory patterns of everyday borders, through an IPS framework, Ruppert (2012) highlights the non-neutral practices of immigration law and the embodied nature of the culture of exclusion of migrants. IPS contributes to border studies by investigating how border security agents become the new actors for discerning risk (Salter, 2007, p. 52) and the new role of information communication(Amoore, 2013; Amoore & De Goede, 2005). IPS helps to ground my questions on the transformation of governance and the use of private actors. To frame my research objective on exploring the relationship between the internalisation of borders, technology and actors, IPS provides a useful lens of analysis to explore the transformation of governance.

2.2.1 Filtering Mechanism of Borders

From the grounding that IPS is a diverse research project, loosely connecting scholars interested in the changing boundaries of the international/national, I rely on IPS to connect my research focus on the administrative aspects of bordering. Bigo (2014) argues that to understand the "governmentality of fear" of border practices, we must look at the justifications and practices of three universes: "the military–strategic field, the internal security field and the global cyber-surveillance social universe" (p. 212). According to Bigo (2014), the three universes of bordering in the EU incorporate how bureaucrats, police, border guards, IT specialists and non-human actors (databases, analytics and predictive algorithms) contribute to how (in)security is produced. The military order refers to security practices. The universe of the military refers to the practice of 'securing' the territorial border, or the physical security of border ports. Andreas (2003) similarly notes that the earlier forms of borders were "purely military" and they have increasingly become intensified by internal policing mechanisms to secure the territorial external border. In alignment with critical border studies (Parker & Vaughan-Williams, 2009), Bigo (2014) argues that the latter of the universes is the more important field in understanding border control operations. Bigo (2014) argues the border imaginary is transformed from a line to a series of "locks" and flows due to the emergence of the second social universe, "everyday practices and bureaucratic routines of the main actors in charge of controls" (p. 213). Building on Squire (2012), Bigo (2014) claims that the modes of securing the border were never about "stopping" but rather "following" and ranking mobility. Overlapping between the second and third social universe, as Bigo (2014) argues, has become a focus for critical migration studies (Broeders, 2007; Glouftsios, 2019; Ruppert, 2012); the instance that governance must be viewed via both knowledge and power relations through practices (Robinson, 2018). Managerial features of bordering have focused on how non-state actors and state actors contribute to the "governmentality" of the border (Andrijasevic & Walters, 2010). Earlier IPS considerations on borders rely on security studies to problematise the new management of migration (Amoore & De Goede, 2005; Huysmans, 2006). The movement away from a security-based exploration of borders can be seen in the attention to the filtering and categorisation of persons maintained by migration governance. Based on Foucault's (1995) concept of the "conduct of conduct", critical border studies (Fassin, 2011) and IPS (Bigo & Guild, 2005b) may be used to consider how, as

borders are no longer territorially fixed, they may function as an apparatus to create categories, rankings and filtrations of mobilities.

As critical borders introduce the question of "when is the border" (Anderson et al., 2009), IPS offers a new framework to consider *how*, in practice, the new managerial power is enacted, particularly the role of computers or databases. Martin-Mazé and Perret (2021) build on Bigo (2014) in their analysis of how non-state actors contribute to the managerial technologies in the EU. The third social universe for Bigo (2014) revolves around the future of bordering via predictive computer logics. The third social universe delves into the "knowledge of computer systems, the capacity to create and manage, through statistics, groups of populations – groups that are constituted through algorithms and profiling, connecting otherwise unrelated individual" (p. 216). Glouftsios and Loukinas (2022) conceptually frame the use of technologies (drones and databases) as contributing to how the "vision" produced by socio technical systems becomes a feature of the governmentality of surveilling the maritime flows in the EU. Based on the IPS tradition, the "knowledge" (Jeandesboz, 2017) produced by border technologies can be critiqued as component shaping migration governance. IPS provides the analytical framework for my approach to the relationship between internal/external border practices and legitimises the need to examine the diverse actors shaping the borders. From Bigo's (2014) landscape of the three universes of governing insecurity, there is a sketching of how we can begin to conceptualise and frame the power of technology intersecting with managerial and military features of border practices. IPS for Basaran and Guild (2017) is a framework demonstrates the need to focus on smaller governance details. I build off Bigo's (2000, 2014) theoretical position that the border has become blurred, and it is crucial to trace the relationship between digital technologies and migration management.

My contribution to border studies relies on using IPS to frame the aspect of migration governance I empirically explore. This will ground my use of critical infrastructure and data studies as I examine the impact of the *Digital* Hostile Environment. A further exploration of how critical border studies have considered the use of technology, specifically biometric technology, will occur later in this chapter. Relevant to the current discussion on how IPS provides a useful analytical framework for my contribution to critical border studies is how there can be a move away from the reliance on security studies to better understand the longevity and effect of digital

technologies in UK borders. As presented here, the puzzle my thesis pieces together is how do we best encapsulate (1) the influence of internalising UK borders and the intersection of emerging technologies and (2) how racial bias is built into, made invisible and reinforced through the reliance on technology. Critical infrastructure and data studies are useful to understand the embedded nature of digital technology and the relationship between race and border technology. From this overview of how IPS frames my consideration of border relations, I go on to clarify how using critical infrastructure studies contributes to critical border studies.

2.3 Infrastructural Consideration of the Border

Why is the infrastructural framework the missing piece of my research puzzle? Infrastructural literature overlaps with my research by deconstructing the procedures, practices, and tools contributing to technologically mediated harms. For Berlant (2016) only when infrastructures break or there is a glitch do the structures which maintain everyday life become apparent. This theory illustrates that those living in London may not think about the aqueducts, dams or reservoirs that create the infrastructure of water being delivered out of our taps. However, the infrastructure would become "visible" or present if the water stopped flowing. Larkin (2013) counters that the invisibility of infrastructure is a privilege; for the few, the many water access, transportation systems and border structures are hyper visible. Infrastructures mediate sociotechnical practices and are a conduit for the delivery of power; again, power here is defined through making individuals productive. Bowker and Star (2008) argue that the information systems that are the basis for infrastructure function through creating classifications. Bowker and Star (2008) problematise the codification and normalisation of classifications through infrastructural processes to claim that there is an influence of informational-based categories and the social world. Pelizza (2020) captures how using governments to manage borders via technological devices and data sharing increases interoperability[5] of border data that reorders and introduces the possibility of new actors. An infrastructural encapsulation of the border considers how the technical increase of interoperability between databases contributes to

[5] Interoperability is defined as the ability of two or more systems to work with one another. This is often a word used when discussing database's ability to exchange data with one another ie: the ability for police database systems to work with Home Office data to check migration status.

new administrative mechanisms at the border, which, as previously established, shapes how persons are treated by migration governance.

An infrastructural appreciation for the routines, standards, and practices that form the *Digital* Hostile Environment creates space to reveal the role of transforming the border. I use Dijstelbloem's (2021)and Mezzadra and Neilson's (2019) infrastructural theories to conceptualise the power relations emerging in bordering practices. Dijstelbloem (2021) frames the border as infrastructure. The border as infrastructure supports this project's examination of the "connection of systems, the categorisation of specific travellers, the power of visibility and the movability of borders. Infrastructural border theory bridges a conversation about how technologies, borders and actors transfer not information but "political systems" that interlock with forms of structural discrimination. Infrastructural theory supports my contribution to critical migration and data studies literature as it prioritises the relations between procedures, standards, and practices in mobility governance.

From Dijstelbloem's (2021) infrastructural lens, there can be a move to deconstruct the power formulations encapsulated in the border practices and methods within the context of the larger structure of migration governance. Border as infrastructure is not defined as the blocking of movement, but as a "transformation of sovereign power (Dijstelbloem, 2021) and a locus to understand the longevity politics of violence and exclusion. Dijstelbloem and Broeders (2015) use Actor-Network theory (ANT) to theorise the instability of information networks. ANT is a framework to connect the socio-political objectives of the social sorting of borders with the practices of abstracting data from bodies. ANT is a consistent framework for Dijstelbloem (2015, 2021, 2011) and supports the infrastructure concept of borders. Dijstelbloem's (2015) use of ANT argues that "the delegation of tasks to both humans and non-humans creates a network of associations in which power relations come into being as an emerging consequence instead of as an intended effect" (p. 29). Indeed, I contend that the racialised bias produced by border technology may not be the "intended effect", but the new power configurations give space for the cementation of discriminatory practices. ANT is an attractive lens through which to explore the "mediation" between non-human and human actors present in databases, and as Dijstelbloem (2021) argues, supports the fluidity of border "as entities that organise circulation and continue the process of movement after the bordering act" (p. 78). While I rely on Dijstelbloem's (2021)

politicisation of borders as infrastructures, mediated through various components that are a mixture of human and non-human, my empirical focus on emphasising the racialised relations emerging in the *Digital* Hostile Environment requires literature that foreground the social dynamics of technology, such as critical data studies.

Lacking from classical science and technology studies (STS) literature, like ANT, is an emphasis on the social logics embedded into the technological systems. Sturman (2006) critiques Latour's rejection of the social for the consideration of technoscience. Social for Latour, described by Sturman (2006) critiques Latour(1987) exclusion of social categories like "gender, race and class relations" (p.182) as reinforcing a fallacy that the technoscience is produced in a neutral manner. Ormrod (1995) argues the ANT approach must include consideration of "*how* the relations of power are exercised and the *process* by which gendered subjectivities are achieved" (p. 44). I draw from Ormrod's (1995) emphasis on the how and process in my empirical exploration of technology intersects with racial subjectivities and transforms the ability of border power to enact exclusionary politics. A contribution of my thesis is the empirical focus on the transformation of administrative practices via technological solutions that are built on racialised notions. I contend that the space I am investigating requires a framework which does not black box (Ormrod,1995) race categories. Critical infrastructure studies provide the grounding that we must consider how technology and actors are shaping/shaped by the border infrastructure. ANT supports the lens to look at the socio-technical relations at the border in a nuanced manner. I build on these considerations to explore how critical data studies in tandem with critical infrastructure studies can capture the digital transformation of UK migration governance.

2.4 A Technological Perspective of the Intersection of Borders and Race

Transformations to the UK border mediated via technology were noted before the so-called Hostile Environment. Vaughan-Williams (2008) demonstrates the transformation of the UK border from "static" to a series of networked security relations driven by the technological dependency and offshoring of border control. The foundation of the Hostile Environment is rooted in early debates on UK borders transforming through the pressure to filter and hierarchise the goods and persons passing through the territory. Vaughan -Williams (2008) traces the Home

Office's recognition of the geospatial transformation of the border, which can no longer be constrained through a straight line on a map, with the parallel emergence of exporting the border to dispersed means of control. Vaughan-Williams (2010) claims the technological reliance and outsourcing of borders were best encapsulated through the term virtual borders; others have used "e-borders" (Allen & Vollmer, 2018; Boswell & Besse, 2023) or "ibordering"(Pötzsch, 2015) and "smart borders" (Leese, 2016) to address the intermingling of technology and control. The term E-borders highlights the creation of an assemblage of data, technologies and the filtering of "normalcy versus security" (Allen & Vollmer, 2018) and recognises the interlocking logics of technologies producing and sustaining historical creations of risk. I-border/ing is a term coined by Pötzsch (2015) to create room for the "non-human agency" emerging in the sociotechnical borders. Terms exploring the technological aspects incorporate an appreciation for how tools project the border beyond the geographical location, formulate and maintain racialised logics of prediction (Leese, 2014) and develop from the changes of power and formation of the border due to new technologies. I draw on critical data studies to capture how technologies are embedded with socially biased relations and are poised to replicate and reinforce past patterns of border practices.

Critical data studies helps my thesis connect historical migration governance practices as an exclusionary mechanism with the technological fortification of borders. As the proliferation of datafied technology shapes how we govern, produces notions of risk and attempts to predict future behaviour (Amoore & De Goede, 2005), critical data studies began to grow. Datafication, as defined by Mayer-Schönberger and Cukier (2013), is the translation of social activities into data formats. Early work on "Big Data" focused on the forms of capital produced via extracting data from users (Zuboff, 2020), the transformations that resulted from how individuals quantified their bodies (Lupton, 2020) and the enhanced surveillance placed on populations (Lyon, 2019). Present in critical data literature is a transdisciplinary approach to investigate how data practices and technologies and assemblages (Aradau & Blanke, 2015) transform power. Legacies of STS are found in critical data studies. These include the concept of the "black box" reinterpreted by Pasquale (2016), Latour's (1979) 'laboratory' (Fejerskov, 2017) and the further deconstruction of scientific knowledge as "truth" or facts by Cheney-Lippold (2017). As the avenues of critical data studies are extensive, I, cannot cover the intricacies of each problematisation of data. I, in

turn, prioritise the section of critical data literature that focuses on the impact of datafied technology on minoritised persons, particularly regarding race relations.

I draw from critical data studies to reinforce the idea that categorical power does not operate in a vacuum; that we must consider the context of tools, technologies and practices. I rely on data feminism to inform the collection of empirical evidence in my thesis, and I build on literature that theoretically explores the harms of data, which will be explored in Chapter Three. A key problematisation of critical studies that I build upon is increasing the use, trust and power of datafied systems that continue to impact minoritised populations in an increased and often invisibilised manner (boyd & Crawford, 2012). Broussard (2023) offers that there is a budding field of critical race and digital studies which provides a "bridge for understanding the intersection of technology and race" (p. 23) (see also:(Nakamura, 2008; Noble, 2018; Steele, 2021)). Chun (2021) foregrounds an investigation into how algorithms and data fuel social division and the claim that we must emphasise how "race and sexuality" (p. 6) are shaping technologies. Race relations codified into data systems are reinforced (Benjamin, 2020), and the two are become accepted (Angwin et al., 2016) by government agencies. A contribution of my thesis is an unearthing of how algorithmic systems, tools and databases are reinforcing and replicating discriminatory outcomes and producing a *Digital* Hostile Environment. My contribution of a new empirical example of racialised technological systems rests on the scholars of critical data studies that prove (1) technology is not neutral but entangled with social relations and (2) the application of data systems increases the capacity for exclusionary politics in an invisibilised manner. The non-neutrality of data systems has been explored through biometrics technology.

2.4.1 Racialisation, Gender and Biometric Technology

Theoretical debates on biometric technology draw on Michel Foucault's theories of discipline, governmentality, and biopower (Epstein, 2007; Maguire, 2012). Fundamental to the examination of biometric technologies is the theory of biopower, which Foucault (1995) argues is a new form of disciplinary power over populations. For Foucault (1978), biopower recognises the transformation of power over the "social body", and the features of various institutions (schools, hospitals, army, police, family and administrative techniques) facilitate the ability to

govern. Biometrics technology refers to measuring, harvesting, and collecting individuals' physical traits. By harvesting biometric data from an individual, their body (fingerprints, retina scans and face) becomes the verification of their identity. Foucault (1995) describes collecting biometrics as a means to discipline the body to become productive. As Foucault (1995) established the historical transformation of biopower on disciplining the body, and thus, making possible the governance of populations, there has been emerging work to critically assess the groups of people biometric technologies are primarily aimed at. The debate on biometric technology now recognises the historical legacies as a colonial means of control.

Biometric technologies, mainly fingerprinting, can be traced back to the colonial desire to control individuals. Cole (2007) argues that technologies capable of collecting biometric data can be traced back to eugenics. Maguire (2012) argue that the "haunting presence of race" lingers in technologies as seemingly benign as fingerprinting. The practice of fingerprinting, pioneered by Francis Galton, was a project in eugenics to try and find "characteristics" of race to mark the "other" as different (Maguire, 2012; Valdivia, 2022). Historically, the features of biometrics are developed to control and maintain racialised populations or to make visible the contemporary pattern of biometrics that makes people of colour invisible or not recognisable by the technological system. Administrative transformation dominates the earlier work on biometric technology, focusing on how the introduction of databases to control the internal migration of the EU produces surveillance around "expulsion" (De Genova, 2017). Broeders (2007) shares a technical appreciation with other biometrics scholars (Ruppert, 2012; Tazzioli, 2022) on the aspects of the databases controlling and categorising mobility within the EU. When scholars discuss the racialised outcomes of technologies filtering via biological characteristics, there is a trend to relate these outcomes to dialogues of risk, lack of rights and glitches in systems (Amoore, 2006; Broeders, 2007). There is a pivot in critical data scholarship to examine the racialisation process of biometrics (Browne, 2010; Pugliese, 2007) and the automation processes of technology (Grondin, 2020) to describe how the technology is discriminatory. Benjamin (2019) argues that discriminatory design, or outcomes, under the guise of the "status quo" business-as-usual nature of racial exclusion reinforces systematic and structural violence. Discrimination has become built into the "machine" (Benjamin, 2016). I agree with this literature on biometrics, including the impact of violence hyper-visibility and invisibility.

Biometric technology is a useful portal into how critical data scholars problematise the abstraction of not considering the historical context of tools, whilst emphasising the racialised outcomes. Magnet (2011) argues that we must consider the systematic failure of biometrics not as a "few bad apples" (p. 8), but as components of a longer historical project. Tazzioli and Valdivia (2023) use historical archives to argue that attempts to apply notions of "fairness" to algorithmic systems "de-historicises" the practice of racially profiling and producing racialised subjects (p. 840). Attention to how racial profiling has been historically coupled with an inequitable structure of power that hierarchies persons as more or less human (Weheliye, 2014) based on biological features, skin colour, and cultural abstractions informs the functionality of today's algorithmic tools. Angwin and colleagues (2016) empirically demonstrate the discriminatory outcomes produced by the Correctional Offender Management Profiling for Alternative Sanctions (COMPAS) tool, an algorithmic system used to risk-assess the likelihood of recidivism and that disproportionately rated black convicts as more likely to reoffend.

Similarly, literature focused on the intersection of gender and technology emphasises the historical and social relations that are embedded into tools, like the gendered division of labour (Cockburn, 1998) or the exclusion of women from the production of technology (Bijker et al., 1989) alongside the gendered outcomes of technology (Broussard, 2023; D'Ignazio & Klein, 2020; Gill-Peterson, 2014). Gender, another social category shaping subjectivity, is often problematised through the larger power structure of patriarchy (Wajcman, 1991). Patriarchy is a key concept introduced by feminist scholars that describes the domination of male over female populations. Considerations for patriarchy argue social structures are skewed to preserve male power (Bernard, 1982). There is work now to understand how technologies, as tools have historically contributed to maintain the larger power structure of patriarchy (Wajcman, 2007) . Critical data studies reveal how algorithms reproduce exclusionary ideals in hiring practices (Kraft-Buchman, 2021), how technological assistants, Siri and Alexa, are feminised (Sweeney & Davis, 2020) and the considerable threat posed to those who do not fit into the binary categories of male and female (Costanza-Chock, 2020). Algorithms are a series of instructions, operations, or commands that produce an output, such as a recipe for a meal (O'Neil, 2016). Noble's (2018) research provides an intersectional framework to consider how algorithmic search engines, like Google, reproduce racial and gendered stereotypes for black women. My use of critical data

studies aligns with the context and focus of my research aims-to unpack power relations at the intersection of borders, race and power.

2.4 Governance and Critical Data Studies

From the literature connecting the practice of biometric technologies to the historical and contemporary reproduction of racialised outcomes, there can now be a connection between how we consider who is made visible at the border. As previously established, IPS helps me contribute to border studies to stitch together critical data and infrastructure studies to consider the transformation, continuation and replication of the Hostile Environment in digital technologies. Between critical borders, criminology and security studies there is consideration of how technology informs the administrative border. Attention to the non-state actor's role in framing migration as a "problem to be solved" has been considered through IPS analytical frameworks (Andrijasevic & Walters, 2010). Andrijasevic and Walters (2010) frame how non-state actors, like Frontex, seemingly provide "technical expertise" to provide control for borders. From the development of a plethora of non-state actors shaping and profiting (Andersson, 2014) from migration management, the focus can be turned to where the border is (Anderson et al., 2009) and how/who is enacting bordering practices. First, the intersection of technology and administrative techniques draws on security studies.

Amoore and De Goede (2005) reveal how the production of risk for some passengers has become 'displaced inside bureaucratic and technological spaces that are difficult to understand, and even more difficult to challenge" (p. 8). Vision, visibility and decision-making intersects for Hall (2017) in their ethnographic research on the data processors for a European border security agency. Important for Hall (2017) is the manner in which human actors (data processors), generated data and border decisions inform one another. Vision, how the data processors interpret and are presented data on the travellers, for Hall (2017) is a vital portal to understand the "conduct of conduct" (Foucault,1995) of border decisions. Building on the transformation of administrative practices due to technological transformations, Ustek-Spilda (2020) observes that the responsibility for decisions bypasses bureaucrats and is relegated to technologies. The Schengen Agreement is a critical policy that has transformed the visa dynamics in EU territory. The 1995 Schengen Zone is a multinational shared agreement on border security (Hanke et al.,

2019) to create a "border-free zone". Notions of sovereignty have been shifted to a collective practice, as citizens from EU countries can work, travel, and move through the EU territories without confronting a border. Rather than a space of free movement, the Schengen Agreement is a proliferation of the constructions of trusted/untrusted individuals (Fassin, 2011) and technologically reinforced border practices (Broeders, 2007). Academic literature considers the role of bureaucrats (Pollozek & Passoth, 2019; Scheel, 2021; Zampagni, 2016) in translating the policy objectives of border control through their practices and interpretations. Core themes emerging from the empirical study on the maintenance of the internal borders, the flow between EU countries, by border enforcement, non-state actors and technology. As the concern for connections between technologies and administrative practices helps contextualise the space I empirically examine, I build off this framing of vision to consider how one can move away from security studies to critical data studies to better understand the order/bordering of the UK.

To connect the technological transformation of administrative functions at the border, scholars have moved from security studies to STS (Glouftsios, 2019, 2021; Glouftsios & Scheel, 2021; Martin-Mazé & Perret, 2021), to capture the socio-material agency of datafied borders. Glouftsios (2019) builds on the concept that information technology is transforming the border to reveal the "interactions between the human (i.e. security professionals) and non-human (e.g., hardware, software, data) agents constituting the system" (p.165). Glouftsios (2019) draws on the STS concept of heterogeneous to capture the "technicalities" of the design of databases that EU border agents use to facilitate the exchange of data, (p. 167). A similar approach is taken by Glouftsios and Scheel (2021) to consider how the design of databases brings together different actors, resulting in performativity of borders, and how identities begin to be ontologically understood through automated practices. I build on these authors to frame my own empirical examination of how data, algorithms and actors interact at the UK border. STS, as a framework for Glouftsios and Scheel (2021), facilitates a "mode of inquiry" that connects the "large digitisation of borders" and the "unconnected borders actors" with the maintenance of restrictive access for certain populations. I build on the STS framework to consider how critical data studies can capture how technology is embedded with racial relations and thus put into infrastructure as a neutral entity that will enact a feedback loop.

Scheel (2021) explores biometric technology as a means of "identifying" migrants and highlights the importance biometric technologies have on inscribing "truth" to mobility decisions. Certain bodies are made risky at the border based on their ability to be "understood" or datafied by biased technology (Kitchin, 2021). The earlier discussion on the processes of illegalisation and verification at the border begins to be conducted through biometric technology. For Aas (2006, 2011), the transfer of verification of individuals to access welfare goods in refugee camps transforms the "body into a password". Similar to other work on biometrics, Aas (2006, 2011) relies on surveillance studies, primarily Lyon (2009), to critique the process of transforming the governance of refugees. The work of Aas (2011) foregrounds a critical transformation that biometric technology introduces: the transformation of the trust of an individual's identity onto a technological machine, like a database. In practice, this transfer of trust would manifest as a migrant being denied access to space if their biometrics did not match or could not be "found" in a border database(Ceyhan, 2008; Leese, 2016). The transfer of identity validity to databases is a vital feature of case studies. The power of visibility, discussed above, needs to be applied to facial recognition technology, which in practice works to legitimise the illegalisation of minoritised populations. An emerging field of critical data studies attends to the new relations of power emerging from data-driven systems, like facial recognition.

2.4.1 Critical Data Studies and the Border

Critical border studies literature has adopted critical data studies to explore the reinforcement of race and power relations (Achiume, 2021; Allen & Vollmer, 2018; Chouliaraki & Georgiou, 2022). My work is grounded in the awareness that borders are exclusionary regimes based on historical relations of division and social sorting; the application of technologies contributes to the deterritorialization and technical opaqueness of internal border logics (Amoore, 2021). Critical race scholars have been in dialogue through the shared projects of decoloniality (Tate & Gutiérrez Rodríguez, 2022; Wynter, 2003) and intersectionality (Crenshaw, 2017; Yuval-Davis, 2011). Both decoloniality and intersectionality position the knowledge structures and discourse present in race relations today as historically constructed through colonial projects (Bonds & Inwood, 2016; Razack, 2008) and white normativeness (Bonds & Inwood, 2016; Hill Collins, 2009; Skinner & Rosen, 2001). My contribution relies on

the work of critical data studies, and critical race literature provides the vocabulary and contextualisation for my empirical contributions to the field.

Facial recognition software works by matching an image with other images within a database; it does so in a rudimentary way of checking for similar pixels of images (Crawford & Paglen, 2021). Crawford and Paglen (2021) argue that within facial recognition technology lies the politics of what the technology is trained to identify. These systems are social and political projects programmed to create new classifications of information. Images are not inherently given meaning but must be codified for computer systems to recognise. What has been uncovered is that in the project of creating facial recognition systems, often, the technology is not "taught" to "see" people of colour and women. Buolamwini and Gebru (2018) argue that the lack of representation in the training data in the facial recognition systems created a need for more accuracy in identifying female and darker skin tones. Browne (2019) argues that facial recognition systems have been calibrated, which "privileges whiteness, or at least lightness" and male faces. Women with darker complexions were "four times more likely" to be misidentified by facial recognition software; this is not an arbitrary "glitch"; it points to a systematic issue of representation in "training and benchmarking data" (D'Ignazio & Klein, 2020). Benjamin (2020) draws on technological "glitches" constructed to be benign but demonstrates that the entity of technological infrastructure is based on a biased social relation of the past. I rely on Benjamin (2020) and Browne (2015) to scrutinise the power of visibility, infrastructural trust, or the "technological benevolence" that persists in UK border technologies; this project foregrounds this critical analysis of all the technologies considered in the case studies. The insistence of Browne (2015) and Benjamin (2020) inspired further work, which insists that placing technology in a race-neutral framework is mutually incorrect and dangerous. The existing literature on the racialised nature of border technologies focuses on biometric tools. As Browne (2019) suggests, the "dark matter" forms the structures of society. Dark matter is a physics term that can be used to illustrate that objects and phenomena which are not visible have a role in shaping the surrounding environment. The work on facial recognition's technical ability to invisibilise or inability to identify darker complexions prompts the need to consider the design features of technology as a feature of the embedded social bias in technology.

Critical data studies frame the governance issue of "artificial intelligence" (Gritsenko et al., 2022) by thinking how we can begin to conceptualise the power of algorithms with the social context they are placed within. Earlier debates of IPS scholars focus on the "power of analytics" (Amoore, 2009; Amoore and De Goede, 2005) through the logics of risk and security. However, critical data studies scholars introduce how the "algorithm becomes the source of political concern" (Beer, 2017, p. 3) beyond the construction of risk as facilitating decision-making processes (Pasquale, 2016). Eubanks (2018) reveals how algorithms, bureaucracy and human decision-makers intersect to facilitate invisibilisation, which "acts a lot like older, atavistic forms of punishment and containment. It filters and diverts. It is a gatekeeper, not a facilitator" (p. 90). The emerging literature in critical data studies foregrounds the empirical focus of my thesis and reinforces the need to deconstruct the operational power of algorithms within governance. There is a balance between not considering algorithmic-based decisions as facilitating a new kind of discrimination and remaining contextualised in the historical modes of power that are being transformed through computational systems. Beer (2017) connects the social power of algorithms to Foucault's (1995) theory of "governmentality" to argue we need to consider the ways technologies are shaping our perception of "truth", "power" and other "discourse". Investigating algorithms through the production, maintenance and perpetuation of "how" power is enacted grounds my deconstruction of the *Digital* Hostile Environment. Critical data studies literature sheds light on why and how data affects governance operations, as it facilitates the increasing ability to share, store and process vast amounts of data (Kitchin, 2021). From the consideration of the influence on algorithms on governance there can be an understanding of how automated tools transform border administration.

Amoore (2013, 2018, 2021) aptly tracks how the functions of algorithms, databases and computer science transform the power and shape of the border. Amoore (2013, 2018) combines questions of security with problems of the logics of risk when critically examining algorithmically mediated processes. In Amoore's (2021) recent work, the construction of the border is deepened to no longer be territorially bounded, to live within the logic of machine learning. What emerges from Amoore's (2021) deepening of the border is to consider how all data can become "border data", not just the collection of biometric information. Grondin (2020), focuses on the algorithmization of migration in North America and expands the consideration for border practices and algorithms. I mirror Grondin (2020) in my consideration of mediation and

the use of an infrastructural lens to deconstruct algorithms at the border. The unique features that arise not just from the external projection of the border/security nexus and the impact on power from algorithms internally within a state should be included in the study of algorithms. Grondin'-s (2020) analysis follows the trend to point to how algorithms, biometrics, and security technologies impact bodies at the border, and argues there needs to be more consideration for how these logics follow, seep and inform security and threat constructions beyond the external border.

Tazzioli's (2022) work exemplifies how an infrastructural lens illuminates the extractive practices of digital tools. Tazzioli (2022) explores the interaction between refugees, digital technologies, and governance actors in the UNHCR to foreground how invisible infrastructure shapes the subjectivity of refugees to be a "forced techno user" (p. 71). Taylor and Meissner (2021) render the new forms of data produced by and through migration governance and informational infrastructure. In a similar vein of argument, Meissner and Taylor (2021) use the concept of feedback loops to prove that the entanglement of technologies, non-state actors and systems "affect society" (p. 3). O'Neil (2016) deconstructs the notion that technologies can produce more equitable outcomes by tracing how algorithmic systems are trained to identify patterns and then feedback solutions that align with the training data. An example of a technology that creates a harmful feedback loop is predictive policing software, like PredPol, is justified as a"blind to race" in a technical manner (may not include direct inputs of race) but in practice uses past policing data to create a prediction of where future crime may occur. Benjamin (2020) expands on how feedback loops occur from the practice of sending officers to minority and poor communities, leading to more arrests in this area, which then feeds into the 'predictive' software as data for where crime occurs. Benjamin and O'Neil both argue that geography is often a "proxy for race" (Benjamin, 2020), with zip codes and postcodes reflecting the segregated nature of society (O'Neil, 2016). Proxies for protected characteristics offer a challenge for proving that a technology is materially discriminatory. Predictive policing software encapsulate how the features of machine learning function to create feedback loops.

Lum and Isaac (2016) identify how predictive policing software-created feedback loops resulted in ethnic and racially biased outcomes. Predictive policing was defined as "applying analytical techniques – particularly quantitative techniques – to identify likely targets for police

intervention and prevent crime or solve past crimes by making statistical predictions" (p.16). As deconstructed in the previous section, the notion of data, especially in the social context, as a neutral source of information is false. Lum and Isaac (2016) echoed this belief in their contention that the models of predictive policing were based on " biased " datasets, thus "reproduced" and "amplified" discriminatory policing. Critical data studies provide the framework to consider feedback loops to understand how powers of classification and visibility interlock to codify, reinforce and replicate discriminatory structures into the future—using this concept to interrogate the border in a different conceptual framework supports why an infrastructural lens is crucial. My empirical work focusing on privatisation, similar to Taylor and Meissner (2021), demonstrates the changing shape and form of the border.

Feedback Loops, infrastructure borders; I argue by connecting these two terms, my project can contribute empirically and theoretically to the changing power relations at the UK border. As discussed, the field of critical border, data and infrastructure studies all urge for contextualisation of technological research. Feedback loops offer a concept to encapsulate the relations, or data, fed into the border technology as baked with social bias, which then produces a discriminatory output. Rubbish in, rubbish out. While the concept of the feedback loop may not seem revolutionary, when we consider how self-fulfilling processes are cemented into infrastructure through the standardisation of technologies the power relations become more complex. For if we know that algorithmic systems operate in a self-fulfilling manner, not predicting the future but reinventing the past (Chun, 2021), the placement of these systems as infrastructural mediators dictating border power clarifies the importance of considering technological systems in the perpetuation of the Hostile Environment. I weave infrastructural consideration for how technology, race and power relations are transformed and how they contribute to the formation of a *Digital* Hostile Environment. I contend that there needs to be an emphasis on how the practices of risk inform and affect internal power. Technology implementation on the external border has been a well-trotted empirical case study for migration studies. What deserves more attention is the internal technologies that are outsourced. There is space to question who is responsible for making, designing and implementing the tools.

2.4.2 Who Builds Border Technology?

One feature of biometric technology that has yet to be explored is a consideration of the privatisation of these technologies, like facial recognition or databases outsourced to third parties by migration governance. Control of border procedures has long been recognised by scholars (Gammeltoft-Hansen & Sørensen, 2013; Torpey, 1999) to be exported from the state to various actors. For Bigo and Guild (2005b), the technologisation of individual identities "stamped by the network of data bases works" (p.7) for government and professionals. The focus of Bigo and Guild (2005) is less on the monetary gain of the private actors working on border control and more on the series of processes, standards and norms introduced by security professionals. I build on Bigo and Guild's (2005) epistemological framework directs to connect the design and development of technology to their producers, in private companies. Broussard (2019) claims the neutrality of technology is misconstrued since "computer program[s] are written by a human being with thoughts, feelings, biases, and background" (p. 27). Similar work has tied together private actors, technologies and borders.

Literature on biometric technology has argued that the role of private firms, like Frontex, critically examine who or how technologies are designed and implemented via private non-state actors (Perkowski, 2018; Pugliese, 2013). The integration of how other constructions influence technology designers provides the relevant framework for this thesis to unravel how the privatisation of technology influences UK migration. Beyond the actors responsible for designing border technologies, the current literature focuses on broader considerations for the monetary exchange between border agents and private actors. The outsourcing of border technologies, Martin's (2021) theory of carceral economies of migration, reveals how outsourcing technologies and detention centres influence migration governance; yet, there is no extensive focus on outsourcing the building of biometric technology. Valdivia (2022) researches the impact of the privatisation of EU technologies via a quantitative analysis of their contractual agreements with third parties is one example of the trend to consider how private actors contribute to the digital economy of migration.

Molnar (2023) draws on critical data studies to foreground that immigration decisions are "inherently complex" yet the new landscape of unbridled "technolsolutionism" at the border

exacerbates the obscurement of who is shaping how border decisions are made. According to Glouftsios (2018), we must study the technical objects, actors and systems that construct the border regime. Similarly to Glouftsios (2018), literature that overlaps critical migration studies and STS (Dijstelbloem, 2021; Pollozek & Passoth, 2019a; Scheel et al., 2019) enables richer discussion of how human and non-human actors interact at the border. I build on the theme of this literature to see border governance not as a perfectly connected, seamless network but as one of many patches, glitches and workarounds (Dijstelbloem, 2021) enabled through faulty technology. As STS contributes to the findings of infrastructural studies' ability to be in dialogue with how border agents engage with technology, and in turn shapes the infrastructure of the border, I can build on this dialogue by integrating critical data studies. As I have explored, critical data studies is deeply engaged with the social bias embedded into technology, which is regarded as neutral or more equitable by governance actors (Broussard, 2019), resulting in the reinforcement and replication of historical patterns of relations. One of the key findings of my thesis is to consider how private actors engage with the maintenance and deployment of administrative technology. The question of how and who builds technology becomes clarified from the empirical findings of critical data studies on the technically skewed nature of facial recognition systems. The findings that the production teams of facial recognition systems influence how the technology operates (Browne 2015; D'Ignazio and Klein 2020) supports the need to look at production teams. An example used by Benjamin (2020) is that facial recognition software developed in North America was better at identifying Caucasian faces, while a system built in "China, Japan and South Korea" was better at identifying "East Asian faces" (p. 100). Attention from critical data scholars to consider how the "the ethnoracial makeup of the software design team" (Benjamin, 2020) or the political sentiments of the producers of technology (Broussard, 2019) informs how I problematise the private actors contributing to UK border technology. As the literature unearths how technology can reproduce and reinforce racialised outcomes, both via the placement of the tool and the technical production, the attention of scholars should turn to considering how this occurs. My contribution is to expand how critical data and infrastructure studies offer a new theoretical framing of the question introduced by critical border studies, "where is the border", (Anderson, Sharma, and Wright, 2009) to address who is building the border.

2.5 Conclusion

My literature review begins by identifying the main empirical objective of this thesis: to identify the transformation of the UK border due to the increased use of digital technology in assisting administrative organisations. How do we combine a focus on technology, race, borders and structural power? To answer this question, I start by identifying how border studies defines the border. From the overview of how the change to see borders from the earlier renditions of territorial boundaries, static lines or demarcation of sovereign power to dispersed apparatuses of control-these themes inform the stance of critical border studies. A relevant theme of critical border studies is the insistence to ontologically conceive the border as a diverse and dispersed series of practices and standards that contribute to the filtering of persons. A useful metaphor to denote this change is a push to no longer see borders as nouns but as active verbs. By adding a gerund to borders, we can identify the range of spaces, tools and methods that contribute to the governance of migration. I trace how the re-conception of bordering can demonstrate the dispersal of the UK border into various public sectors and link the tactics of filtering persons.

In the context of the UK, Yuval-Davis, Wemyss and Cassidy (2018) frame the emergence of using public sector spaces (NHS, landlords, schools and welfare schemes) as extensions of immigration control as a process of (b)ordering. By tracing the historical and contemporary process of bordering Yuval-Davis, Wemyss and Cassidy (2018) contributes to how I frame the policies from the Hostile Environment. Based on the question “when is the border” from critical border studies (Anderson et al. 2009), I build on an empirical exploration of migration governance that entails a wider empirical focus than the territorial exteriors of sovereign spaces. To capture these transformations, I rely on IPS as an analytical framework. I repurpose the figure of the Möbius ribbon that Bigo and Walker (2007) propose to demonstrate the blurred boundaries for the border's internal/external security discourse. An IPS as an analytical framework bridges my concern for critical border studies’ inquiries into the transformation of migration governance and builds on the emerging literature that uses critical infrastructure and data studies to consider the impact of automated systems in relation to the decision-making process within the UK migration governance.

Critical border studies provides the vocabulary and attention to the changing nature of politics, while IPS is needed to frame why and how practices are important avenues to explore political transformations. IPS emerged as a project to reorient and question the academic practice to be bounded through their own disciplines. By using IPS as part of my analytical framework I'm able to frame the administrative practices of the home office as a liable political investigatory sphere. Bigo and Walker (2007) are curious about how we can reconsider boundaries like the international and sociology call not as bounded and fixed but as fluid entities. IPS is drawn to spaces that emerged as new sites of power and bring together different actors, technologies, and practices that shape the governance of people. However, IPS often draws from securities studies contributing to how risk is constructed at the border (Amoore, 2013; Amoore and De Goede, 2005). Security studies facilitate the IPS consideration for how the emergence of technologies, non-state actors and new spaces of bordering are now relevant in the migration governance, and building on this work, I use the analytical framework of IPS not to contribute to a security-based exploration of the *Digital* Hostile Environment, but to consider how the practices and technologies shape current, and future, border infrastructure. I mentioned IPS as an analytical framework to ground my empirical focus on administrative features of bordering and utilise the problematisation of the project to contribute to critical border studies. My contribution to border studies is through the combination of critical infrastructure and data studies to reveal how technology is transforming and reinforcing biased practices from the past.

My infrastructure lens is complemented by the scholars who have proved the social and political constructions of border power yet draw in a discussion on technology as an empirical focus—critical data studies terminology compliments into infrastructure studies' features through the feedback loop concept. The focus on how outcomes, be they in policing, migration, or probation cases, are informed by algorithmic processes, trained on past social biassed relations, shape future outcomes captures what this thesis will prove—the use of technology within the UK border reinforce and replicate past racialised border decisions. Critical data studies clarify the argument that technology is not a neutral entity and expands the types of technologies that can be explored as a racialised apparatuses. Critical data studies have revealed a richer inspection of how technology, like facial recognition, replicates social bias. Including literature that captures the relationship between technology and reinforcing racialised outcomes provides the necessary framework to inspect the border technologies used by the Home Office as products and producers of racialised outcomes. There is a need to consider the socio technical mediations that facilitate the exchanges of information, sentiments and politics of belonging through the infrastructure of borders. The framework of infrastructure informs this thesis hypothesis that there is a *Digital* Hostile Environment, in practice reinforces and replicates racialised relations As the infrastructural lens of this thesis is grounded in a constructivist methodology, informed by

border studies, it contributes to finding that the shape, form and power of the UK border have been morphed into a Möbius strip, as responsibility, decisions and management of border practices are simultaneously internalised and exported via technologies. I now provide an overview of my methodology.

Chapter Three: Methodology

This chapter is an overview of the research methods I use to investigate how technologies are amplifying and reinforcing the discriminatory outcomes in migration governance. The systems that I explore exist in the background of migration governance, in the "depth of the border"(Amoore, 2021), often without the overt knowledge of migrants. My data collection focuses on clarifying how technical systems played a role in classifying and sorting individuals. To reveal the emerging *Digital* Hostile Environment, I deploy mixed methods to show how technology transforms the application of power at the border. I use semi-structured interviews and Freedom of Information (FOI) requests alongside actor mapping to argue that the border has topologically transformed into a Möbius strip. My methods integrate investigatory tools to describe and visualise how border technologies operate; I adapt a new approach for each case study based on the available materials. The aspect of migration explored in this thesis is that of regularised migration and the visa regime and does not focus on the experience of asylum seekers.

My overarching research question asks how the interaction between digital technology and borders is transforming power relations. Under my umbrella interrogation of this relationship is the focus on how the continuation of the Hostile Environment, the goal to spread both real and omnipresent border controls throughout the UK, is continuing to border through racialised notions of belonging (Yuval-Davis et al., 2018). My research design must conceptualise the sociotechnical nature of technology to reveal how the digital infrastructure is poised to reinforce and replicate past migration patterns. In essence, this thesis is concerned with the black boxing of migration decisions and digital technology used to uphold the administrative procedures of the Home Office. My research uncovers both how the technical features of digital systems operate and how the Home Office frames the use of technology at the border to contribute new empirical knowledge on the continuation of the Hostile Environment digitally. My methods must then be informed by practices that can capture how bias (Fink, 2018; O'Neil, 2016) can be baked into technological systems whilst engaging with the larger political landscape of borders as historically operating to hierarchise, prioritise and rank certain mobilities. Benjamin (2020) writes the "black box" is a common "STS analogy" to describe the production of technology as being not visible to the public, programmers nor the users. For Benjamin(2020) the idea of a

“anti-black box” becomes a crucial analogy to interrogate “race-neutral technologies that encode inequity to the race-neutral laws and policies that serve as powerful tools for White supremacy” (p.30). From the framework of the anti-black box, or simply the rejection that the social production of technology cannot be revealed, I frame my methodological choices to explore the *Digital* Hostile Environment. Throughout the chapters I confront and use what is concealed by the Home Office as empirical data, whilst unpacking and researching the black-box of border technology.

This chapter first defines how critical constructivism informs the epistemological framework of considering the objects of study constructed by and within human power relations. I then define race, gender and bias, followed by a contextualisation and argument for why I chose the UK as a case study and the specific technologies I examine. I move to explain how data feminism informs the ethos and the infrastructural approach to considering technology's influence on UK migration governance. Before covering what is included in this thesis, I justify what is left out or not included explicitly, primarily the collection of migrant perspectives. From covering what is excluded and the limitations of my research, I move on to explain how I collected the empirical data. I hope to transform this document, my thesis, into a resource to resist discriminatory power relations. The afterlife of my thesis will be a “living document” in the digital space that uses the data collection practices of my research to be a resource for other actors to resist the *Digital* Hostile Environment; this is done in part to transform the power of the archive (Foucault, 2010). In alignment with critical constructivists' rejection of positivism, my methodology is poised to question and problematise technology’s contribution to the categorisation of subjects.

3.1 Defining Race and Gender

To conceptualise race, one must ontologically trace how race has never been a static, consistent but adapts to suit hierarchical power relations. For Chun (2009), race has never been “simply biological or cultural; rather, it has been crucial to negotiating and establishing historically variable definitions of biology and culture. To think of race as a technology allows there to be an appreciation for the “historical ontology consistency” (p. 411). Labels, categories, race, and gender are all socially created. Chow-White (2020) summarises the two ontological

approaches to race: in the first, biology is a component in the "hierarchical power" tied to physical traits; the second consists of a cultural appreciation of constructing race (p. 83). Chow-White (2020) astutely argues that as race claims become *indirect,* this new form of the racialisation, the cultural appreciation for the construction of race, of a person is re-coded into digital technologies, which introduces a new mechanism for the further inscription of the production of "race". Ludwig (2020) agrees that the constructivist ontology captures the social "hierarchical power" of race rather than purely the biological and cultural orientations. A constructivist definition of race does not ignore the biological or cultural elements of the category but rather applies the historical practices which have worked to legitimise the social category imposed on people.

Recognition that race is a social construction does not suggest that the study of categorical power is mute, but rather insists that identifying how the binaries influence social reality is crucial to identifying the continuation of hierarchical power structures. One only has to think of Fanon's (2021) use of linguistic and psychological constructs to identify how the "black man" is constituted through the "epidermalization", the internalisation of racial violence, onto the body (p.11). Epidermalization connects the social aspects of race as a project of domination with the impact of the concept on the psyche of racialised persons. One of the most crucial frameworks Fanon (2021) offers is an epistemological argument in which he states that categories placed on persons, racial or otherwise, have psychological and hierarchical power over subjected groups. A necessary distinction is that my project uses the concept of racialisation to demonstrate the idea that technical agents, algorithms, databases or machine learning are not *racists* but rather introduce new means for race to become relevant. Racialisation is a socio-political process (Weheliye, 2014) that embodies the constructivist gaze on when categories become relevant in shaping the reality of persons; my interest is how digital technology can exacerbate the process of legitimising racial categories and inscribing new meaning. Similarly, gender at the intersection of technology has been deconstructed.

Gender and sexual orientation-based discrimination have been considered by critical data researchers through the scope of classification power (Cheney-Lippold, 2017; Costanza-Chock, 2020; Wachter-Boettcher, 2018). Cheney-Lippold (2017) and Costanza-Chock (2020) highlight how the unconditional desire to fit people into classifying boxes interlocks with the inability of

technical systems to reflect the complex expression of gender. Cheney-Lippold (2017) draws from critical data studies to focus on the intersection of everyday life and data collection technologies. The scope of data mining and everyday lives skews the lens of Cheney-Lippold (2017) on identity formation changing due to technologies. Costanza-Chock (2020) offers that there needs to be a collective effort to build more compassionate and just technologies; paired with Cheney-Lippolds's (2017) account, these contributions emphasise the dangers of classification. According to Costanza-Chock (2020), a deeper consideration of practical design applications may help build the ethos of technology to better interact with the complicated nature of human identity and experience.

The ontological problematisation of categorisation offers insight into the social nature of categories taken as absolute-male/female, heterosexual/homosexual, black/ white, and citizen/ migrant. Classification systems are then exported to technological systems as inputs or data. Skinner (2020) acknowledges "racial and ethnic categories (as) flawed and contentious" and rely on individuals to uphold them. As knowledge, data, and categorises are all social constructions, Bowker and Star (1999) argue that only with an appreciation for the production of "instruments" that make data useful can there be an examination of the power productions. From this ontological understanding of the need to problematise the "natural" conceptions of categories and tools of knowledge, like data, there can be a definition of what results from the categories of power, mainly social bias.

The mysticism surrounding technology is another public discourse that needs to be deconstructed. By debunking this statement is one of the primary purposes of this thesis; about technology and race, this section will briefly introduce some of the most convincing theories on why the above statement is false and dangerous. Social bias can be unintentional, subtly reflecting broader cultural or organisational values. For example, machine learning algorithms trained from human-tagged data inadvertently learn to reflect the biases of the data analysts (Diakopoulos, 2015). A striking example of this would be how the categories of the US census have historically been shaped and are shaped by political identity (Bouk, 2022). For the study of 'boring' things (Star, 1999) like categories, information systems and data can reveal the infrastructure that upholds the prioritisation of some, and the discrimination of others. By

deconstructing that technology that uses data, and creates outcomes from this information, ontologically replicates existing bias (D'Ignazio & Klein, 2020).

My appreciation for critical constructivism supports the research objective of how technology continues and reinforces racial outcomes at the UK border. Rather than contributing to legitimising the categories of race and gender as natural, my intention is to identify these concepts as powerful categories which shape the reality of all subjects. In my definition of race and gender, I reflect that the concepts are subjective and contextual. As my case study focuses on the UK, I adapt the categories, theories, and debates most relevant to understanding the historical conceptualisation of race. I apply this literature on how categorisation becomes relevant as it aligns with the epistemological approach to unearth the relations of power which are socially constructed. I am supported in this effort by applying methods drawn from critical data studies and infrastructural studies, as there is a shared critique on the narrative of categorisation being natural. I include an overview of how gender is a component of categorical power as in Chapter Five, I examine the historical continuation of gendered notions of valid love matches. While the interaction of identity and data extractive technologies inspires the research of my thesis, as it is a fundamental problematising of digital technologies, the scope of this project deals with the consequences of categorisation; regarding mobility chances and rights. The process of categorising an application as red risk, via an algorithmic system, has an impact on how the applicant will be perceived by the Home Office decision maker, and thus informs the ability for an individual to live, work and visit the UK. I explore the consequences of categorisations in Chapters Four and Five. As the categories of race and gender have been explored in regard to interactions with technological systems, there can be a discussion on the practice of discrimination.

3.1.1 Defining Discrimination

At the heart of this thesis is how people are being discriminated against by technological interventions, but defying discriminatory outcomes is no simple task. What does it mean to discriminate? To discriminate is to show preference for one thing over another; in some contexts, a harmless practice, picking up a cookie over a bag of crisps for example, discriminates between snacks. So when does discrimination become harmful? Synonymous with social discrimination,

the preference of one group of people over another is the concept of stereotypes and prejudice, which are just as slippery to define. A *stereotype* can roughly be defined "as knowledge structures that serve as mental "pictures" of the groups in question … the traits that we view as characteristic of social groups, or of individual members of those groups" (Nelson, 2016, p. 2). Psychologists have added to the definition of stereotypes by suggesting that these are often unconscious biases formed within individuals; laboratory experiments were conducted to measure the "unfair coding" participants had for certain social groups (National Research Council, 2004). Reskin (2012) uses systems theory to conceptualise racial discrimination to link how disparities between "sub-systems" perpetuate biassed outcomes. Implicit and explicit bias are knowledge patterns that contribute to the perpetuation of stereotypes (Maniloff, 2021). By understanding the predisposition of human actors to perpetuate to bias outcomes within bureaucratic structures (Lipsky, 2010; Park & Favero, 2023), my work contributes to identify how the technologies used reinforce and replicate social bias. A definition of discrimination on any protected characteristics, I argue, must consider how different aspects of an individual's identity shape their experience in society.

I adopt Gilmore's (2007) argument that "institutions are sets of hierarchical (structures) relationship that exists over time …. racism is the state-sanctioned or extra-legal production and group different vulnerability to premature death" (p. 28). I argue that Gilmore's (2007) definition of racism concerning institutions, structures, and the state is needed to understand how technology intersects at the administrative practices at the border. From the feminist tradition, I use the term patriarchy to capture the legal, social and cultural prioritisation that contributes to "male domination" (D'Ignazio & Klein, 2020). As institutions, structures and the state are all explored in this thesis to varying degrees, I now emphasise the constructivist view that the categories function to create the discriminatory differences of chances at and beyond the UK border. My empirical findings are best suited to explore how racial bias is reinforced by digital technologies, however, I encourage future work to build on my findings to explore how gender, and other protected characteristics are impacted by the *Digital* Hostile Environment. Empirically, race is the focus of my project, yet to avoid a narrow consideration of identity politics, I rely on an intersectional inspired approach to appreciate how individuals' experience structural power. I reflect that an individual's race, class, gender, sexuality, disability and religion all construct their experience of power. I do so to methodologically appreciate the co-production of power.

Interlocking oppressions is a slightly different approach to viewing oppression than data feminism, which uses Hill-Collins's (2009) "matrix of domination" to understand "how systems of power are configured and experienced. It consists of four domains: the structural, the disciplinary, the hegemonic, and the interpersonal" (p. 11). Hill-Collins (2009) similarly focuses on gender and race in her depiction of power but insists that there is an appreciation for all experiences under the idea of the "matrix of domination". While the approach may differ in wording, my thesis will borrow both methods of seeing oppression. I accept that oppressions are "interlocking" (Basham & Vaughan-Williams, 2013; Razack, 2008) and must be considered to see the connection of oppression that manifests through the four domains aforementioned. Basham and Vaughan Williams (2013) define interlocking as seeing identity features as "interdependent and inseparable" and apply the term to broaden the scope of critical border studies. For Basham and Vaughan Williams (2013), the interlocking features of political economy, race and gender form provide context to one another, and astutely, the authors argue that bordering logics are possible by "highly gendered and racialised and are structured by economic conditions of (im)possibility" (p. 2). By connecting Hill-Collins's (2009) theory on the stratification of how oppressive power operates with the features of interlocking, I move empirically to focus how technology contributes to reinforcing discriminatory outcomes. I insist that the definitions and conceptualisation of how race, gender and border power interlock recognise the complex relations of powers. As discrimination is an empirically difficult concept to explore, I rely on traditional concepts like racialised, gendered and political power to observe the legacies of a hierarchical social bias. From the core definitions of race and discrimination, I now contextualise my choice to use the UK as a case study.

3.2 Why The UK? Why Now?

The lacuna in border studies to not consider the ramifications of the digital technologies in the Hostile Environment inspires my use of the UK as a case study. As Chapter Two outlines, my work is grounded in the multi-disciplinary literature covering the impacts of the Hostile Environment policies and focuses on the legal dynamics of "deputising border control" to private citizens (Griffiths & Yeo, 2021) and the racialised impact on the internalisation of border checks (Parmar, 2020; Yuval-Davis et al., 2019). I rely on the existing work that positions the Hostile Environment as a series of dispersed policies that reside in the ethos of various government

departments rather than a cohesive White Paper (Griffiths & Yeo, 2021) and are straining the fragile politics of belonging to non-white communities in the UK (Yuval-Davis et al., 2018).

Existing work on the impact and consequences of the Hostile Environment focuses on addressing the "what" aspects of power in the UK border; I uncover the ramifications of the "how". The answer to "what" makes up the Hostile Environment can be found in legal work, which has offered a practical grounding in the framework (Griffiths & Yeo, 2021) and provides a richness in details of the scope of UK migration governance. Parmar's (2020) work focuses on the intersection of race, technology and borders through her fieldwork in UK police stations. Deepening the range of research that interrogates the new power dynamics emerging through the internal spaces of the border, Parmar's (2020) work encompasses the trust, racialisation and relations of technology in policing the UK populations. Parmar (2020) uses an ethnographic approach in a mixed methods application of observation, interviews and public records. An ethnographic approach of methods suited the scope and detail of Parmar's (2020) research agenda to focus on one UK operation enacted due to the Hostile Environment. My methodology draws from a similar realm of top-down power. My research questions are:

- Has the ethos, goals and intentions of the Hostile Environment become embedded into digital technologies at the UK border?
- How does the design, implementation, and practices of border technologies contribute to racial biases in UK migration governance?
- How do private actors who contribute to the construction of border technologies influence the dynamics, power and shape of the UK border?

My focus is not on proving the Hostile Environment has internalised racialised borders within the UK, as this has been established, but instead focusing on how the technologies used to maintain the border are cementing practices; my case studies are directed at decision-making procedures.

3.2.1 Justification for Case Studies

My research expands the academic understanding of the *Digital* Hostile Environment and reveals how the technological underpinnings of the series of policies shape and manipulate the

UK border. My selection of case studies reflects the breadth of tools used in the maintenance of the *Digital* Hostile Environment. I start with the Streaming Tool, a past, non-operational technology placed at the exterior border. By the external border I mean this tool is facilitating visa applications from persons who wish to visit, live and study in the UK. The Sham Marriage Tool is a technology developed and used today in migration governance and is responsible for internal control of borders by disciplining marriages between UK and non-UK nationals. Finally, Atlas is a developing project that differs from the algorithmic systems previously mentioned but is a digital identification service that will be used by the Home Office to manage migration cases. The technologies covered in my case studies reflect the complexity and expand the definition of the *Digital* Hostile Environment.

As previously discussed in Chapter One, the term *Digital* Hostile Environment has been used in the public sphere, mainly by Foxglove, Liberty and the JCWI, to demonstrate the harms of sharing data to maintain the internalisation of borders and the persistence of the UK government to have a fully 'digital' border (Foxglove, JCWI, et al., 2021). My examination of the Streaming Tool expands the definition of the *Digital* Hostile Environment and provides a clear example of an algorithm reinforcing and replicating discriminatory outcomes. Discrimination for this tool is defined legally through the campaign against the algorithm, citing the use of nationality as a factor in the risk assessment as a violation of the Equality Act 2010. This case study contributes to answering the research question of how technology has reinforced, invisibilised and reproduced racialised discriminatory structures, or the ethos of the Hostile Environment, within migration governance decision-making. This case study is vital to begin the investigation into the *Digital* Hostile Environment as it was decommissioned at the time of writing, meaning there was more publicly available information. I continue the examination of the Streaming Tool's replacement system to argue that the Home Office's use of algorithms can adapt to avoid legal retribution, but the possibility of producing racialised outcomes remains. This case study alone could not contribute to a complete picture of how the UK border has become internalised, nor could it speak to the form or power of the border. To further explore internalisation and the UK border, the case study of the Sham Marriage Tool is required.

The Sham Marriage Tool is a component in managing internal and external borders and expands the investigation of the *Digital* Hostile Environment. The Home Office uses this triage

tool, a ranking system, to determine when a UK national and a non-UK citizen require an investigation into the validity of their marriage. Like the Streaming Tool, the Sham Marriage Tool fits into the category of an algorithmic system replicating and reinforcing racial discrimination via its outcomes. My exploration of another algorithmic system builds upon the arguments of Chapter Four. This case study expands the empirical evidence for how technologies can replicate, invisibilise and reinforce bias, as the Sham Marriage tool does not use nationality as a *direct* input, yet it yields racially discriminatory results. This case study contributes to the argument that discrimination can arise from algorithmic means from proxy factors and the impact the internalisation of the border has on UK citizens. Through exploring the new categories algorithmically imposed on citizens entering a marriage with a non-UK citizen, there is a risk of being technologically framed as a risk. Development of the Sham Marriage Tool begins to explore the ambiguity of actors designing and developing border tools. Examining the logic of the Sham Marriage tool reveals new shapes and forms the border takes as technology is increasingly applied. Due to the limited material available on the Sham Marriage Tool, the impact of private actors and the full scope of internalisation of borders can only partially be realised. To continue exploring the infrastructure of UK borders, the case study of Atlas is crucial.

The final case study of my thesis explores the development of a new Home Office system, Atlas, and furthers the exploration of the impact of private actors and the new shape and form of the border. Atlas is the new case working system for the Home Office, replacing the current system Case Information Database (CID). Atlas is the Home Office's attempt to streamline, automate and expand the platform's capabilities, for managing migration governance. Using Atlas as a case study differs from the earlier technologies, as it is not an algorithmic system and has not recorded racially discriminatory results; yet examining Atlas offers a chance to see the patterns and exportation of responsibility through technological projects. Atlas speaks to the core of the theoretical argument of this thesis that infrastructure is a crucial framework to understand the interlocking power dynamics of technologies and borders and contributes to the final discussion on the influence of private actors on a *Digital* Hostile Environment. The power of automation emerges from unearthing the data-sharing practices facilitated through the Atlas system and the pattern of implementing technologies unfit for purpose. While the previous case studies, Streaming Tool and Sham Marriage, demonstrate a clear pattern of an algorithm

producing racially biassed outcomes, Atlas offers a hazier future of how discrimination will be perpetuated in the Home Office's attempts to create a fully digital border. All three case studies introduce patterns and tensions arising through the exportation of the ethos of the Hostile Environment into the digital world and contribute to the final two chapters of the thesis that build on the private actors and emerging Möbius shape of the UK border.

To fully explore these case studies, I use mixed methods that rely on publicly available and privately sourced information. I do not include a case study of the algorithmic process used for the EU resettlement scheme. I do not explicitly focus on technologies that govern and control asylum seekers. Atlas briefly examines how the failures of the database, and poor quality of data, intersects with asylum seeker governance in the UK. My contribution in deconstructing Atlas is to consider the patterns and practices arising in border technologies, I am unable to speak deeply to the impact on asylum seekers in the UK. I hope from my empirical findings on the infrastructural embeddedness of digital technologies, intersecting with racial power, can inspire work to explore the impact on asylum in the UK. My exclusion of case studies, on asylum seekers and the EU resettlement scheme, is based on two reasons: first, there has been academic work that explores the intersection of race and technology focusing on the EU and asylum system (Maxwell & Tomlinson, 2022; Positive Action in Housing, 2021; the3million, 2022; Yong, 2023); second, the technologies I wanted to explore are in the "back-end" of the immigration process or have been obscured from the public and migrants view. From this justification of the case studies, I include and those I do not include, I can now move on to explain the framework for my methods—data feminism.

3.3 Data Feminism

Data Feminism is a book by Catherine D'Ignazio and Lauren Klein (2020) designed to educate data scientists to deconstruct their knowledge practices to the centre of how power is produced through technological systems. Following the publication of this book, there has been a shift for scholars to align themselves with the label of a "Data Feminist" when describing their research aims and has embodied a new wave of using academic literature as a source of "activism" (Nasrin, 2021). I use the emerging school of data feminism to guide my methodological principles. There has been work to use data feminism to consider the ethical

principles of datafied borders (Turculet, 2023) and to make visible the labour and technical opacity present in the EU border (Valdivia, Aradau, et al., 2022). While the purpose of the data feminists' principles is to guide computer or data engineers on principles to adopt to try and create more equitable and just technology, I use the same framework to deconstruct technology. By guiding my methodology through data feminism, I am able to bridge the epistemological and ontological contentions with technological systems. Data feminism provides the language and framework to incorporate the theory of critical constructivism, to see objects, power and institutions as relational (Jung, 2019) to understand how technology, actors and outcomes are produced and producers of unequal power distributions. Shared between critical constructivism and data feminism is the link between knowledge and power. Data feminism provides a framework to emphasise the knowledge/power relations produced by technological systems. As I am curious about the relationship between the UK border technologies, the production of governance knowledge and the reinforcement of racialised outcomes, data feminism provides the framework for my empirical findings. As I have connected by critical constructivist framework with the methodological practice of data feminism, there can be an overview of how I utilise the principles of D'Ignazio and Klein (2020) to expand how by making visible the logics of technology there can be an engagement with the power of technical systems features.

Data feminism began as a toolkit, or set of principles, for computer scientists to consider when producing technology. I use the emerging school as a framework to engage with the relationship between migration governance data and power. In practice, this means highlighting the seven components of the Data Feminist approach: to "examine power, challenge power, elevate emotion and embodiment, rethink binaries and hierarchies, embrace pluralism, consider context, and make labor visible" (D'Ignazio & Klein, 2020, p. 17). I pair data feminist principles with researching technology to focus on the socio-political impact of technology. Data Feminist methodology enriches my consideration for the unknown components of technology by recentering the discourse of analysis to the question of visibility, outcomes and asymmetries caused by the technologization of governance (Valdivia et al., 2022).

The first principle of data feminism is to examine power, "naming and explaining the oppressions baked into our lives and datasets" (D'Ignazio & Klein, 2020, p. 24). Data feminism draws on Collins's (2009) concept of the "matrix of domination" to explain how systems of

control and power are experienced. I ground my methods in a structural understanding of power to support the theoretical approach of relying on infrastructural literature to conceptualise the border, as previously explored in Chapter Two. The questions I asked when choosing my three case studies (Streaming Tool, Sham Marriage and Atlas) were informed by a similar unearthing of how data systems have a "privilege hazard": they serve prioritised populations. My focus on technology had to balance the historical and existing structural power dynamics while addressing what was "new" about how power was dispersed. As my research aim is to consider how the digital systems upholding the administrative function of the Home Office are operating and in dialogue with racialised power the data feminist principle of methodology grounded in challenging power supports my aim. Specifically, the principle of challenging power helps supports my methodological choice to use analogy, or similar technology, to hypothesis deeper embedded racial logics. By connecting how technology like facial recognition has been found to disproportionately not recognise darker complexations with the larger network of the Streaming Tool (Chapter Four) I am able to make a stronger statement about the longevity of racialised logics. My methodological choice to uncover the private actors contributing to Home Office technologies is informed by the first principle of data feminism as D'Ignazio and Klein(2020) argue we must consider the "elephant in the server room: the demographic of data scientists… do not represent the population as a whole" (p.27) and this can contribute to technical design failures. This principle helps to link my methodological choices to uncover the 'black box' of administrative technology with the larger power institutions of borders, meaning the unequal distribution of chances at the border which are informed by a legacy of exclusionary policies. My alignment with the principle to examine power through my research speaks to my loftier ambition to expand our understanding of why digital technologies are crucial to how power operates in the administrative features of the UK border. Embedded into my methods is a framework that grounds technology not in a separate realm from politics but insists that technology's development, deployment and outcomes are political. Data feminists push to examine power as a principle and to challenge power.

The principle of challenging power informs the grounding of my work to focus on the technical infrastructures of the Hostile Environment to question whom the technology is serving. By elevating emotion and embodiment are other principles directed by my methodology. I maintain the connection that technology and surveillance have a historical legacy of disciplining

racialised bodies (Benjamin, 2020; Browne, 2015) throughout my data collection, I approached the information through the appreciation of disrupting surveillant lineage. Benjamin (2019) uses a similar positionality in constructing their methodology; by looking "beneath the surface" of technologies and at the encounters between technology and populations. The process of examining beneath and the surface of technologies is present throughout Benjamin's (2019) presentation of empirical evidence to support the claim that technology, like race, is a series of processes that historically and currently maintain control over populations. I mirror Benjamin's (2019) presentation of technologies in the pattern of detailed explanation of a tool's use, network and technical infrastructure and contend how the technology is a means of control or discipline. A method of using descriptions of technology is found in work that focuses on the border (Broeders & Dijstelbloem, 2016; Scheel & Gutekunst, 2019). Descriptions and making visible the interconnection of technologies with actors, networks, and structures of power prove to be effective methods of challenging the power of the digital border, for the technical opaqueness of tools vastly contribute to the ability for discriminatory outcomes to become the status quo. From the principle of challenging power, my data collection was poised to interrupt the narrative that technology is neutral or to rethink binaries and hierarchies.

Binaries and hierarchies are crucifixes of power at the intersection of borders and technology. The data feminist principle of questioning binaries and categorisation frames my methodology. Chapter Two explores a gap in the literature on the Hostile Environment and UK borders; it is a technically detailed exploration of the systems in place to maintain migration governance. From the data feminist principle to rethink binaries and hierarchies, there is an emphasis on the reliance—algorithmic or data systems-centred—on binaries. Binaries and categories emerge as a classification of power (Hacking, 2004), and I emphasise how systems can be designed to reinforce categorical power via technology operating at the border. Costanza-Chock (2020) describes how border security at airports entails a full body scan of passengers and operates based on binary gender categories, either female or male. For transgender passengers, passing through a body scanner becomes a moment in the cis-gender binaries of the technology to create a risky subject due to the anatomical revealing of individual genitalia that is exposed through the biometric scan. Costanza-Chock (2020) emphasises how norms and socio-political categories are reinforced and designed into technologies. In the moment of tension in a trans-body that does not conform to the programmed binaries, as Costanza-Chock (2020) argues, the

passenger becomes a risk, an outlier or even a threat. I direct attention to how technical systems reinforce and rely on binaries and hierarchies to function. Data feminist principles contribute to my ability to frame how technologies reinforce the categorical power of borders.

The final two principles that frame my methodological approach are considering context and making labour visible. My methods are holistically grounded in the unequal distribution of opportunities at the border and contribute to work to have a more precise visualisation of distributions of power. I poised my data collection to participate in the broader collective action to grasp the inner workings of the Home Office via connecting and making visible labour or the manufacturing of technology. The practice of making labour visible will be discussed later in the chapter when I cover how my data collection is repurposed for the public arena. The above overview of data feminist principles offers the framework and mentality that influenced the ethos of my methodology. Feminist principles speak to the "so what?" of my methodological practices. Borgman (2018) notes that while science seeks to portray itself as universal, "their practices are local and vary widely"(p.38). Thus, data does not simply represent the world's reality, but are constructions about the world. From a data feminist methodological framework, my methods are poised to conceptually and empirically explore the relationship between technology, borders and race in the UK context.

3.4 Mixed Methods

I have justified the framework and the scope of my data collection; I now summarise the methods I used to conduct my research. This section begins with an overview of the semi-structured interviews I conducted and my ethical approval. I move to discuss the desk research I conducted that falls into three categories: (1) policy and public report research, (2) freedom of information requests and (3) contract analysis. Through the overview of my methods, I will ground the choice through existing literature and demonstrate how they reinforce the framework of data feminism as my methodology.

3.4.1 Semi-Structured Interviews:

I conducted eleven interviews with immigration experts, activists, academics, technology researchers, and solicitors. I received ethical approval to conduct interviews with participants

employed in the civil sector on the 16th of April 2022. My participants were given a participation form on why they were selected and an overview of my research before the interview. The use of direct quotations is often from participants with a legal background. The use of direct quotes and material derived from these interviews is limited as the format of the interviews tends to reflect an establishment of a research connection rather than a passive two-way conversation. My other participants formed not one discussion but a relationship of collaborative practices.

I move beyond the semi-structured interview format, which has been critiqued as a method for the extractive nature and asymmetrical power that the researcher has over the participants (Doucet & Mauthner, 2008). To avoid extractive practices, I made two methodological choices, the first being to not collect data from migrant populations. The majority of the work done on migration in the context of Europe is based on a series of fieldwork with migrants, specifically in the context of refugee camps (Pallister-Wilkins, 2020; Pollozek & Passoth, 2019). While recognising that not including migrants could be seen as an erasure of their voices-as my case studies work outside the knowledge of migrants to interview subjects about their experience with technology that may have processed their migration case without their knowledge-there is a risk of evoking negative emotions from interviewees. Similar concerns were raised by one of my interviewee's subjects, Mia Leslie, who works in the legal research sector of their organisation, the Public Law Project (PLP). Leslie mentioned that when PLP interviewed marriage applicants who may have been processed by the Sham Marriage Tool, the participants were distressed to hear their cases were algorithmically processed, as they were not initially informed about the automated processes. I share Leslie's and PLP's concerns that data collection from migrant populations, who have faced difficult circumstances from Home Office practices, about back-end systems may cause harm. I do not collect this data. I focus on interviewing actors presently resisting Home Office policies.

I conducted 11 interviews with experts from various disciplines, which, as a methodological practice, is a time-efficient means for a researcher to gain “crystallised” forms of knowledge (Bogner et al., 2009). The chart below summarises the participants and their associations. Meuser and Nagel (2009) define an expert interview as based on their knowledge of a specific area. Expert interviews are not to be confused with 'elite' interviews (Leech, 2002), the practice of interviewing participants who can directly impact outcomes, like members of

Congress in the US. All my interview participants are experts, from different disciplines, on aspects of the *Digital* Hostile Environment, with a shared interest in unearthing socio-technical systems and rethinking how borders and technology intersect. The purpose of these interviews was to gain more knowledge and insight into the technical details of the case studies or tools; for this purpose, capturing the expert perspective supports my research objectives. A breakdown of my participants is as follows:

Figure 2: Interview Participants

Interviewee	**Gender**	**Occupation**	**Format**	**Location**	**Multiple Interactions**[6]
1	Male	Solicitor	In-Person	UK	No
2	Male	Academic	Online	UK	Yes
3	Female	Policy Researcher for PLP	Online	UK	Yes
4	Male	Technology Researcher at Med Confidential	Online	UK	No
5	Male	Journalist	In Person	UK	Yes
6	Female	Academic	Online	UK	Yes
7	Female	Policy Researcher	Online	UK	Yes
8	Female	Policy Researcher	In Person	UK	Yes
9	Male	Academic	Online	UK	No
10	Female	NGO Worker	In Person	UK	Yes
11	Male	NGO Researcher	Online	UK	Yes

The selection of my interview participants aligns with the emerging trend in social science research to use persons privy to the research environment. I recognise the feminist critique that in the practice of interviewing experts there is a power imbalance between the interviewee and the interviewer (Lokot, 2021). To be consistent between my methodology and

[6] This is defined by if the interview resulted in multiple emails, further meetings or data sharing.

ontology, I practice reflectively on my structural power (Gergen & Gergen, 2007). As I navigate the expert field, I am not speaking to individuals in the same categorical power as myself, but aspects of my background may grant me access to these spaces without my full awareness. As a legalised American immigrant in the UK, I am not subject to a nexus of criminalisation, my position as a young, female, middle-class and mixed-ethnicity researcher in my expert interviews may grant me access to realms of knowledge that are obscured to others.[7] My practice reflectively is to speak to how my research aim is to uncover racialised outcomes based on social constructivist epistemology; I must recognise how my reality is constructed. As feminist scholarship (Bogner et al., 2009) encourages one to empower interviewees by letting them lead the discussion, my interview questions were semi-guided, with only the last two questions remaining consistent. I maintained the same format of all the interview questions with a rough outline as seen below:

1. What brought you into the {field of concern}
2. What is your biggest concern
3. What tactic/tool has been the most successful at resisting {field of concern}
4. I may have a specific technical question on the tool I have approached them about
5. I may have a specific technical question on the tool I have approached them about
6. What makes you optimistic about {field of concern}
7. Is there anyone you can think of that may be relevant/ or can speak to me about {field of concern} further?

This formula of interview questions summarises the aim of my research, which is to gain more expert knowledge on particular aspects of the *Digital* Hostile Environment. I ended with two consistent questions, as shown above in the list. One of the questions, number six, helps not have the entire conversation be about what is going wrong or what we do not know, but to maintain a practice of positivity. Question seven I ask for a connection to find a new expert to interview. I gained access to the experts through two main avenues: getting one interview and having this connect me to the next and working in the charity sector myself during my PhD with the group

[7] I use my experience as a visa holder as a narrative tactic to illuminate the privilege and ease I have with the visa regime and to try and connect the reader to how when we speak about technology we must remember the human relations that are being transformed.

No Tech For Tyrants. The final question in the interview aligns with the methodological practice of using the network of experts to find further interview participants. The above chart of my participants includes whether the interview included more than one encounter and if further data was shared. Around 73% of participants resulted in further collaboration, evidence of the methodological practice of building collaboration networks rather than a static extractive practice of interviews.

The move from a semi-structured interview format to a collaborative research network is demonstrated clearly with two contributions to research projects. I was acknowledged in two significant research projects (Ozkul, 2023; Public Law Project, 2023a) for my input into creating a clearer picture of some of the automated tools. These acknowledgements from two actors I initially sought for an interview, and, in turn, the exchange developed into a collaborative method of knowledge exchange speaks to the emphasis of data feminism on non-extractive methods. Using interviews as a method to practice not a narrative framework of migrants, but to build on knowledge practices that unearth the technical infrastructure of the Home Office is informed by the principle of data feminism to challenge power. My desk research began with analysing policy reports and other publicly available sources.

3.5 Desk Research:

Border decisions, processes, and policing have never been entirely transparent to the public. As my research objectives are to unearth the power relations between technology and the UK migration process, I have to use methods to assist in un-obscuring the state. Pelizza (2019) argues that the state is constructed through layers and secrets, and secrecy can be transformed into a means of understanding relational notions (political relationships and modes of knowing and seeing). How the knowledge of the border process is constructed and framed by various actors is of epistemological importance for my research objective. As the area I am researching, border and technology, are both obscured in various ways from the public view I employ different methods to capture the interaction between the Home Office and digital tools. My overall goal is to contribute new empirical knowledge to the infrastructural longevity of exclusionary politics and each facet of my desk research explores different constructions of state knowledge. Under desk research, I look at three types of state formations of knowledge: (1)

policy reports, (2) Freedom of Information reports (3) private contractors for the Home Office. Each source of information is obscured and constructed based on the author's positionality. As my research questions the relationship between the use of technology, border administration and the continuation of racialised power dynamics my desk research is designed to make visible and describe the features of my case studies. I recognise that no information is neutral, nor is my interpretation of texts; the use of policy reports contributes to making visible the infrastructure of digital border technologies.

3.5.1 Policy Reports

I drew from existing policy reports and government documents to research secondary and primary resources. I began with the Streaming Tool, which, because it was decommissioned at the time of writing (Summer 2024), there were more publicly available documents on the tool's features, including case documents. My research draws heavily on the Independent Chief Inspector of Borders and Immigration (ICIBI) reports on the developments of the Home Office. My semi-structured interviews provided an opportunity for me to learn tactics on how to make use of the reports for my research. One key tactic relating to the ICIBI reports came from a solicitor who worked on the Streaming Tool case and noted that paying particular attention to the footnotes of reports is a crucial source of information for scholars and researchers, for the footnotes often alert to new or developing technology. ICIBI's role is to examine the Home Office's operation and feedback to the department on the findings, to improve the efficiency and equity of the border (Home Affairs Select Committee, 2024). Former Chief Inspector, David Neal, criticises the Home Office's repression of the reports, which intensified under Priti Patel (Home Affairs Select Committee, 2024). ICIBI reports are not read in my thesis as clear, neutral productions of knowledge, as there are bureaucratic constraints from the inspector if they are appointed by the Home Office to the role; instead, these reports are a glimpse inside some of the obscured bordering practices. One of the main purposes of the ICIBI reports for my thesis was to find relevant case studies. For in the footnotes of ICIBI, I found reference to the Sham Marriage Tool and Atlas. Policy reports about my technology covers only one portion of my methodological approach; the other facet includes finding relevant information.

To find relevant and valuable reports on the case studies, I explored layers of the internet, the top layer of easily accessed reports and documents and the second hidden layer of documents that had been obscured. The latter is the method summarised above of searching key governmental and legal documents, while the former requires training. As already discussed, some of the training I received was informal and part of knowledge-exchanging practices during interviews; I received more formal instructions on investigative methods through a workshop run by Anna Feigenbaum, Professor in Digital Storytelling at Bournemouth University. In this workshop, Dr. Feigenbaum instructed on methods to use publicly available tools like Google Search to help find documents that may not appear on populated pages. The workshop inspired the latter part of my methodology on curating my research as a resource, which will be discussed later in this chapter. Before naming the practice of making my research a resource, I relied on the Data Feminist methodology to inspire my methods to be features of challenging power. The principle of challenging power and making labour visible informed my practice of making FOI requests in the public domain.

3.5.2 Freedom of Information Requests

As I exhausted what could be discovered from publicly available documents, I used the information I collected to engage with public departments, like the Home Office; I chose to make these FOIs in the public domain. Requests were made to a governmental agency to increase the transparency of actions, policies and decisions in the public realm. The Freedom of Information Act (2005) was enacted in the UK in 2005 (Amos, 2001). The purpose of the FOI is to create an open and accountable government and provide an avenue for the public to request information on public bodies. Sociologists (Calavita, 1992; Fuller, 1988; Noakes, 2000) have explored how FOI requests are an appropriate research method to uncover the government's standards, procedures and processes. Noakes (2000) observes that the method of requesting and analysing FOI reveals the role of “street-level” bureaucrats in shaping the operandum of the government. Calavita's (1992) theoretical stance from FOIs on the FBI illuminates that state practices are not “monolithic, nor are they coordinated” (p. 17). It is important to note, as Garnett (2019) argues, that FOIs are how states *construct* their information and are often obscured. In the UK context, Lee (2005) historicises the process of FOIs to argue that the introduction of FOI changed the appearance of the “ultra-secretive” British government. There are notable exceptions and

limitations to the information requested via a FOI. In the UK, information requests are subject to a "public interest test": the balance between the government's interest in national security or international relations, with the public's need to know aspects of state practices. Browne (2015) introduces *Dark Matters* with her experience requesting the FBI's file on Franz Fanon. I use Browne's (2015) method of drawing on her failed experience of receiving unredacted files on Fanon to frame the "ontological conditions" which inform how "surveillance reify boundaries along racial lines, thereby reifying race, and where the outcome of this is often discriminatory and violent treatment" (p. 11). Based on the practice of sociologists, I used FOI requests to unearth standards, procedures, and administrative practices that contribute to the reinforcement of the *Digital* Hostile Environment.

During my research, I made 14 FOI requests available to the public domain through whattheyknow.com. My choice to make these requests online rather than through a private portal, i.e., an email, is to use my data collection to inform the public. FOI requests are components of making my research a resource and a means of primary data into the procedures, standards and operation of technical systems in the Home Office. Below is a chart of the title of the FOI request, the date the information was received, the department in which I requested data from and if the FOI was successful, in that the department provided the requested information. My FOI requests include:

Figure 3: Freedom of Information Requests

Number	**Title Of Request**	**Date Of Response**	**Department Requested**	**Successful**
1	The Use of C(loud)	24 November 2021	Home Office	Yes
2	Private Sector and ATLAS System	24 March 2022	Home Office	No
3	Case Management Systems	13 June 2022.	Home Office	No

4	Transfer of Data from Case Information Database to Atlas	19 December 2022	Home Office	Yes
5	Data Sharing with the Home Office	12 May 2023	Department for Levelling Up, Housing & Communities	Yes
6	Data Sharing between Combined Homelessness and Information Network (CHAIN) and Home Office	26 May 2023	Greater London Authority	Yes
7	DVLA and ATLAS	31 May 2023	Home Office	Yes
8	Data Analytics Competency Centre and Data Services and Analytics	31 May 2023	Home Office	Yes
9	Data Analytics Competency Centre and Data Services and Analytics	18 September 2023	Department of Health and Social Care	Partially
10	Flagging Overseas Visitors on the Spine System	21 September 2023	NHS England	Yes
11	Use of ATLAS System	8 November 2023	NHS England	No
12	Status Verification and Enquiries Checking (SVEC) and Immigration Enforcement Checking and Advice Service (IECAS)	27 December 2023	Home Office	No
13	An Equality Impact Assessment for Complexity Application Routing	15th April 2024	Home Office	Partially

	Solution			
14	DPIA on Complexity Application Routing Solution – Visits (CARS(V)	15th April 2024	Home Office	No

My most successful request for information is in the form of a Data Protection Impact Assessments (DPIA), a mandatory form for departments to provide under General Data Protection Regulation (GDPR) (Information Commissioner's Office, 2023). Another form I received under FOI is the Equality Impact Assessment for products; another requirement under the GDPR. The successful and unsuccessful requests, defined as if the information I requested is granted and proven, are equally considered throughout this thesis. I position and repurpose Pasquale's (2016) image of the "black box", which is placed over the inner mechanism and logics of tools, not as an obstruction of knowledge but as a source. I refer consistently to repurposing of the black box to cast light around, through and beside obscured information to view how the emerging infrastructure fills the space. Browne (2015) uses the astronomical phenomenon of black matter, black holes, to theorise and analyse the material manner in which a phenomenon which cannot be observed has a gravitational force or structures and is the "universe of modernity". The framework of invisible structures as Browne (2015) stipulates is not what cannot be seen but what is seen by *whom* (p. 5). I repurpose this framework to argue that what is being obscured, much like a black hole, does not need to be "opened up" to render how the obscurity functions, but broader questions around the standards of practices, rules can emerge from what is hidden. The method of filing FOI demonstrates the practice of active primary data collection and navigating the hidden spaces of the UK border. Another active part of my desk research was the collection of contracts for border technology.

3.5.3 Contract Analysis

I began by collecting relevant contracts between the Home Office and private actors for border technology projects. Limited by what is available and published in the public domain, I worked to synthesise the aspects of over 50 contracts I engage with direct quotes and portions of the documents throughout my thesis, outlining the services the Home Office receives from private actors. This method is limited to what is published, for some contracts posted on the

websites “contractfinder.com” or “bidtender.com” do not have attached documentation, but consist of only details on the amount, duration and company of a particular contract. Public tenders make the monetary exchange between a public body and private actors visible but they are only required to be published if the contract is worth over £12,000 (Cabinet Office, 2023). Contracts as primary resources methodologically are for Valdivia and authors (2022) framed by Data Feminist principles of rethinking binaries/hierarchies and making labour visible. Aspects of rethinking binaries can be framed as what is visible or invisible, what is included in the contract and what is not. I draw from these contracts empirically to support how border operations are transferred to private actors. To answer my research question on the impact of private actors on the *Digital* Hostile Environment requires more than a quantitative summary of how much money is exchanged between the Home Office and private actors. In the opportunities where contracts were available, I used this information to see how responsibilities, priorities and standards move from the private realm to the UK border.

My method in approaching the contracts is to identify new data on the technical details of the case studies and timelines or descriptions of how the Home Office frames the function of specific tools. In some instances, there were contracts in which, by using direct search functions, i.e. looking up “atlas” or “triage tool”, I could find more details on the case study technology. I use the redacted information of contracts as an empirical finding. As mentioned above, in the section on my FOI requests, the redactions of material by the state on their practices give insight into operations they deem necessary to obscure. The process, procedures and standards for which information can be open to the public and which cannot give us insight into how the Home Office constructs a particular image of the border. Often, the material redacted would be under the box of “data controller” or individuals who have access to components of the tool, leaving us to consider how the Home Office practices concealment for the further internalisation of the border.

Based on a critical constructivist epistemology, I further problematise that what is missing from the contractual agreements for border technology is a contextualisation in the politics of migration. In the contracts, the Home Office may state there needs to be a priority in ensuring correct data is matched to profiles, yet there is no grounding in what data errors at the border can mean for migrants' ability to enter or remain in the UK. According to critical

constructivism, all knowledge and practices are constructed based on power relations. Hence, in the case of the Home Office, the agency's effort to build border technology without providing a clear grounding of how the tools created to assist in the governance are informed by a series of socio-political power relations. I gather further details on the history and ethos of private actors, by using web-based research on companies. Internet research on companies includes reading the websites, case studies and services that the private actor advertises on their website. My methodology is in dialogue with a consideration for how we can make visible constructions of security.

My engagement with how the Home Office constructs the technology and the role of the private actor gives me a clearer image of how dispersed the functionality of border technology becomes. I draw on the contracts through direct quotes or images of the document to give the reader a visual rendering of how the Home Office and the private actors construct their relationship. As Ferhani and Nyman (2023) ask, what does security look like? Can we make these invisible practices visible? I use a similar approach to bring forth the visual components of the redacted content of the contracts. From my research into the contracts between the Home Office and private actors, what became apparent is the multitude of actors responsible for the construction of border technology. To capture these relations between the Home Office, multiple private actors and a singular piece of border technology, I opted to use the methodology of mapping the connections. My mapping method speaks to the data feminism methodology to make visible relations of power.

The mapping tactics visualise the connections of firms, monetary gain from the migration governance and patterns of reliance on specific actors. I drew inspiration from the principle of making labour visible and the research practice introduced by Dr Feigenbaum of turning data collection into a public resource. I have uploaded the contract data collected over the three years of investigating onto a public hosting website, "Kumu", so other researchers can access the information. Marres (2015) argues there has been the practice of mapping "controversies", but there is a need for connecting the issues of digital systems. Cartography of controversies is an STS concept to investigate public debates (Venturini, 2010) developed by Latour (2008) insists researchers should observe the connections between public contentions. Mapping as a method in the STS school is supported by the Actor-Network theory to identify the traces of public debates

left on digital platforms. Critical data studies have reimagined the methodology of mapping to make visible not just debates, or controversies, but the actors and institutions that inform algorithmic systems. Stop LAPD Spying and Free Radicals (2020) adapted a method of algorithmic ecology contextualising the socio-political layers informing technologies. Rakova and Dobbe (2023) translate the algorithmic ecology approach to address the lacuna in academic consideration for auditing and resisting automated systems. My method of mapping the private actors responsible for designing, implementing and maintaining the technologies discussed in the case studies aligns with Villa-Nicholas's (2023) objective for the dispersal of border logics to become visceral, or understand "there are people in there (border technology)" (p. 329). My methodology supports my research question of making visible the technological features of the back-end obscured features of the Home Office administrative procedures. By using a combination of methods, supported by the ontological framing of technology as both productive, and producers, my research design is poised to uncover the features of a *Digital* Hostile Environment.

3.6 Conclusion:

I use mixed methods ranging from semi-structured interviews to submitting FOI requests to answer how technology has impacted the UK border and created a *Digital* Hostile Environment. I use investigatory methods to explore the relationship between technology, borders, and infrastructure to unearth emerging power relations. For my semi-structured interviews, I develop these exchanges to become not an extractive, one-way directive of information to me from the participants but a collaborative means of exchanging knowledge. Beyond my eleven interviews with professionals, I draw from publicly available reports and documents and filed FOI to unearth the logics of the technology covered in my case studies. My mixed methods build on the existing research on UK borders but directs more attention to the technological features, which I argue have created a *Digital* Hostile Environment. From this overview of my methodology and a grounding in the relevant literature in Chapter Two, I now introduce my first case study the Streaming Tool.

Chapter Four: Automated Decision Making and the Streaming Tool

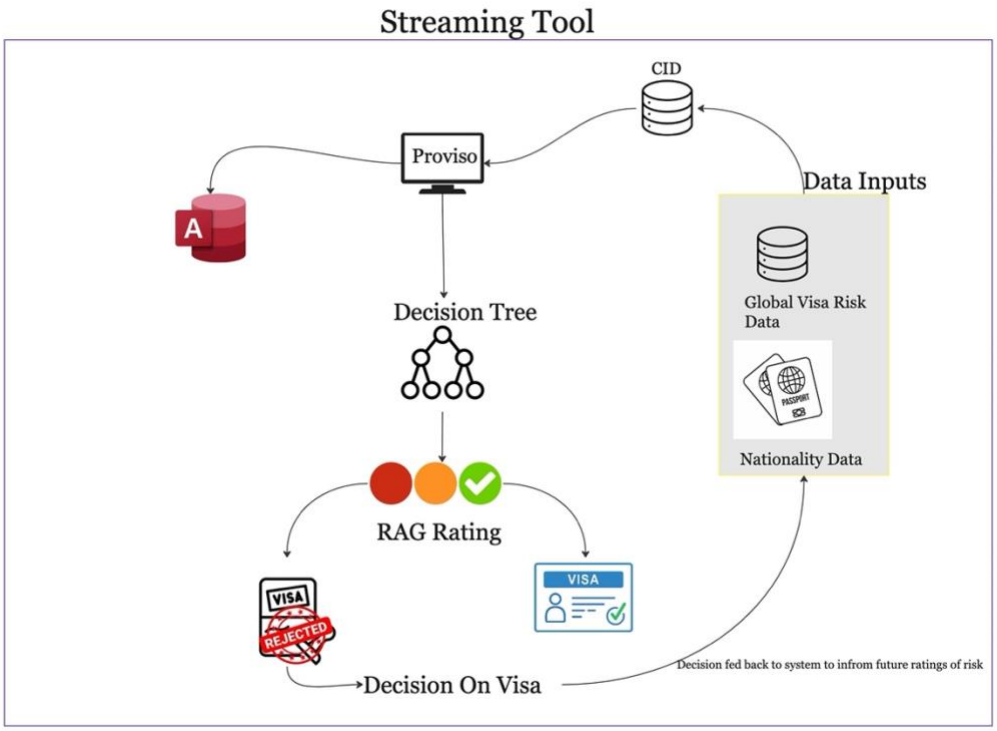
The Streaming Tool algorithm assigns traffic light colours (red, amber, green) to categorise risk assessments for UK visa applications. This chapter's reading of the Home Office's algorithm builds upon infrastructural theories of migration governance (Dijstelbloem, 2021; Mezzadra & Neilson, 2013). The academic literature concerning the Streaming Tool is novel and has primarily only been debated in the legal sphere (*JCWI v. SSHD*, 2020; Maxwell & Tomlinson, 2022). This chapter argues that the Streaming Tool reinforces, replicates and invisiblise discriminatory mobility decision-making structures in UK migration governance.

The structure of this chapter is as follows. First, there is a contextualisation of the visa regime and the pitfalls of the algorithm. The sociopolitical contextualisation of the Streaming Tool is followed by a comparative analysis of how different actors, the Home Office and the Joint Council for the Welfare of Immigrants (JCWI), define the Streaming Tool. This initial discussion of how the Home Office describes the algorithm suggests the narrative of neutrality that migration governance propels in constructing their tools. This chapter argues that the proposed simplicity and objectivity of the Tool omits the wider infrastructural power symmetries present in the algorithm. I propose an infrastructural examination of the Streaming Tool's digital infrastructure (software, database, data or connected networks) linked directly to and in parallel with the sociopolitical infrastructure (legal debates, influence on human actors, policy goals) to reveal the features of this algorithm. The term infrastructure is defined in Chapter Two. To reiterate, the concept emphasises the particular connections that are made between various networks, both social and technical, and how they contribute to “asymmetries of power”, often in

an invisible manner (Dijstelbloem, 2021). I conclude this chapter by problematising the Streaming Tool's replacement, the Complexity Application Routing Solution (CARS). By examining the CARS system, the need to explore algorithmic systems is clarified; although the Streaming Tool was scrapped, the harms done by its procedures, standards and practices remain. When examining the technical faults of the Streaming Tool replacement, intended to improve the equity of decision-making, it becomes clear that the process and standards of incorporating protected characteristics continue to produce risk profiles. I argue that examining the Streaming Tool's legacy programmes further legitimises the infrastructural lens of my thesis. If one considered the Streaming Tool a standalone product, the harms of introducing digital technology at the border would be incomplete. The methods of this chapter build on the mixed approach, as earlier discussed in Chapter Three.

A textual analysis of the algorithm derived from publicly released documents allows this chapter to unearth into the technical aspects of the Streaming Tool. Revealed in FOI requests, the Streaming Tool operates within a digital infrastructure consisting of two main components: (1) the software (Proviso) and (2) the database (Central Immigration Database (CID). Through analysing both components, this chapter reveals that these systems' logics complicate the Streaming Tool's impact on UK migration governance. After a technical examination, this chapter discusses the legal contentions that emerged from the lawsuit proposed by the JCWI against the Secretary of the Home Office. The Streaming Tool case study argues that the Home Office's sociopolitical infrastructure contributes to dispersed biased outcomes within UK migration. This chapter argues that the Streaming Tool has sociotechnical embedded bias beyond the surface level of the algorithm. Through a textual analysis of publicly released documents about the Streaming Tool, this chapter interrogates the Streaming Tool's technical infrastructure. For visual reference to the infrastructure, below is a map of the Streaming Tool:

Figure 4: Systems Map of Streaming Tool



Before there is a deconstruction of the sociotechnical features of the Tool, there must be a contextualisation of how the algorithmic decision-making process operates within the administrative border or visa regime.

4.1 Visa Regime

As Chapter Two establishes, the administrative process—passports, visas, and watchlists—create hierarchical categories of migrants. Take two people—each wanting to travel to the UK to attend a graduation ceremony. One is my mother, Jeanine, a United States citizen. The other visitor, Mohamed Zahir Zazai, father of Sabir Zazai the chief executive of the Scottish Refugee Council, who was awarded an "honorary doctorate from Glasgow University for 20 years of civil service" (Hill, 2019). Jeanine and Mohamed want to come to the UK to attend a graduation celebration. Jeanine buys a ticket, brings her passport, and sees her daughter, a non-UK resident, graduate from Goldsmiths University in 2019. Mohamed's journey to the UK begins with the application for a visa, not a plane ticket purchase.

Ease of mobility is largely dictated via the global visa regime (Salter, 2006), which upholds unequal access to space via passports and visas. These two individuals are on their journey to the UK to celebrate achievements. Jeanine does not need a visa to visit the UK for less than six months of travelling in the UK as a tourist (US Embassy & Consulates in the United Kingdom, 2022). This ability is based on Jeanine holding one of the most "powerful passports" within the global visa regime, putting her into a hierarchised category as a "trusted traveller" (Salter, 2006). Mohamed is placed at an institutional disadvantage as a citizen of Afghanistan; he must apply for a tourist visa to come to his son's celebration. As Scheel (2021) postulates, what is embedded into the application for a visa are "invisible requirements", suggesting that it is not just about meeting the documented requirements for a visitor visa and the "informal" requirements. Scheel (2021) argues that the "informal" requirements are based on "biographical features" as indicators of the presence or absence of "migration risk" constructed by migration decision-making infrastructure (p.151). Mohamed's first visa application was rejected because the Home Office "does not believe he would return home to Afghanistan" (Hill, 2019). Only when this rejection received political pressure from various MPs and organisations(Refugee Action, 2019) could Mohamed book a plane ticket, grab his passport and visa, and be reunited with his family after 20 years to celebrate an achievement. Jeanine and Mohamed's experience travelling to the UK situates the infrastructure of the visa regime. Passports and visas are not the only technologies that uphold visa infrastructure.

Prediction as a bordering practice involves the investigation of how the visa regime has been technologically transformed to capture or assume the future actions of travellers (Amoore, 2013; Amoore & De Goede, 2005). As stated in Chapter Two, immigration controls are not neutral, but instead create "status" (Anderson, 2013) and hierarchy among travellers (Chouliaraki & Georgiou, 2022). I argue that the logics of machine learning in this entangled site of sociopolitical negotiations leaves room for the "informal requirements" (Scheel, 2021) to become codified in the process of decision-making. Visa decisions exist in an infrastructurally invisible realm, but I build on the argument that opaque technology exacerbates the discriminatory structures of migration governance. The case study of the Streaming Tool furthers the argument that placing an automated tool within visa decision-making draws on historically biased data to produce discriminatory migration outcomes. From this understanding that the

Streaming Tool is a feature of the administrative border's sociopolitical relations, there can now be an exploration of how the algorithm functions with the bureaucracy of the Home Office.

4.2 Contextualising the Streaming Tool

Trust in the Streaming Tool was built into the bureaucratic function of the Home Office. The JCWI and Foxglove pointed to how the discriminatory flagging of certain nationals was then paired with the bureaucratic logic that the caseworkers would have to justify for "red" flagged cases, explaining why they were accepting the application; this justification was not needed for the green cases (*JCWI v. SSHD*, 2020). Efficiency "targets … known as 'productivity expectations', daily expectations, and benchmarks" are placed on the individual employees of the Home Office (Bolt, 2018b, p. 41). A Home Office spokesperson revealed, to the *Guardian*:

> UK Visas and Immigration received more than 3.3 million visa applications in the year ending June 2019, of which just under 2.9 million were granted … The service standard for processing a visit visa is 15 working days. Last year, we processed 97% of this target. The UK welcomes genuine visitors. Over 2.4 million visitor visas were granted for leisure, study or business, an increase of 8% in the past year (McDonald, 2020).

The "productivity expectations which require decision-makers to assess many more Green-rated applications than Red-rated ones in a day, thereby encouraging a reliance on the Streaming Tool allocation as an aid to decision-making" were raised by the JCWI as a bureaucratic instrument to allow for the racialised results of the algorithm to prevail (*JCWI v. SSHD*, 2020, p. 20). The ICIBI (2018b) wrote that "an internal UKVI review of Indian applications in September 2018 found that 65 per cent of those streamed RED and 88 per cent of those streamed AMBER were issued, concluding that the streaming criteria could be tighter" (p.32). In particular, the green, amber, and red rating systems significantly impacted the results of the visa applications. JCWI's legal contentions were that if these rejections and risk ratings are all linked to nationality, there will be a confirmation bias within the algorithm and with the human users. Red-flagged applications (51.41%) are rejected at a higher rate than green-flagged applications, exemplifying the consequences on individuals' right to mobility based on algorithmic decision-making (Bolt, 2017).

A senior Home Office administrator justified the loss of Visa Application centres[8] and the exportation of that risk calculation into the Streaming Tool by "working with IE (Immigration Enforcement), which allows us to capture local attributes through the streaming tool while ensuring that that knowledge is used in a consistent and auditable manner. Relying on systems and tools to identify risk allows us to ensure that risk analysis is available to all caseworkers, not just those with experience working in certain locations" (Bolt, 2018b, p. 43). The ICIBI (2018) revealed that:

> several decision-makers told inspectors that there was an over-reliance on the Streaming Tool to identify the risks within an application rather than on their abilities and that the role of the ECO was being 'dumbed down'" as a result. However, managers stressed that the Streaming Tool only highlighted known risks, and it was still for the decision-maker to evaluate all of the evidence in front of them … Some staff were concerned about potential 'blind spots' in the enrichment and verification processes (p.46).

These infrastructural compromises, fulfilled by the biased technology of the Streaming Tool, furthers the spread of migration governance as it exports authority/trust to the technical components of the Streaming Tool. These aspects are present in the Streaming Tool's function in the Home Office. Present in the Streaming Tool's logic is the incentive for Home Office caseworkers to accept the ratings interjects a formulation of an infrastructural compromise between exporting decision-making to technical agents away from human agents. The bureaucratic need for efficiency and algorithms' computational power allows two biassed infrastructures to merge. From this exploration of how the Streaming Tool's placement within the bureaucracy of the Home Office poises the algorithm to become infrastructurally trusted, there can now be a consideration of how the technical components of algorithms legitimatise biassed outcomes.

4.2.1 Pitfalls of Algorithms

I borrow from critical data studies to situate the Streaming Tool within the debate on the sociopolitical repercussions of algorithms. Research into algorithms' discriminatory features reveals the Streaming Tool's pitfalls: (1) discrimination is produced more efficiently, and (2) the

[8] Visa Application Centres(VACs) are offices that applicants must go to apply for a visa from outside the UK, they are supported by local staff to collect biometric details and information. The Home Office sought to close these centres and consolidate the risk, surveillance and data collection from local visa offices to 'private actors' and technology to support the UK Home Office staff to make visa decisions. (Bolt, 2018b)

constructed neutrality of technology disguises historical discrimination. Benjamin (2020) argues that "algorithms may not be just a veneer that covers historical fault lines. They seem to be streamlining discrimination … Algorithmic neutrality reproduces algorithmically sustained discrimination" (p.127). The Streaming Tool exacerbates "sustained discrimination" in UK migration governance under the veneer of neutrality.

Computers can compute mathematical equations, pattern recognition and outputs faster than humans (Kitchin, 2016). Whilst in a binary space, increased efficiency and neutrality may be possible, complications emerge when technical interventions are made to dictate, solve and assist in social dilemmas or techno-solutionism (Morozov, 2014). Broussard (2019) deems the overuse of technologies in social spaces as "technochauvinism" - a concept explaining how male-dominated traits are associated with technologies and the frequent use of technologies in social fields today. The prioritisation of efficiency allows for the implementation of imperfect systems. No mathematical model is perfect, and as Crawford (2021) argues, "machines are asymptotic, never reaching full precision"(p.114). There will always be outliers that the operation cannot process, and programmers know this, but the algorithms are still used even when racialised outcomes occur (Benjamin, 2020). Algorithms' racialised outcomes are constructed as glitches in an otherwise perfectly functioning system. Benjamin (2019) proposes that "glitches are not spurious, but rather a signal of how the system operates. Not an aberration but a form of evidence, illuminating underlying flaws in a corrupted system" (p.80).

The discriminatory outcomes of the Streaming Tool are to be read in the same way. To highlight the racialised nature of the algorithm is to demonstrate that there are not simply glitches in the system. Noble (2018) coined the term "technological redlining" to describe the "power of algorithms in the age of neoliberalism and the ways…digital decisions reinforce oppressive social relationships and enact new modes of racial profiling" (p.15). The Streaming Tool is an example of the "technological redlining" of specific mobilities in the UK because certain nationalities were systematically excluded from entering the country. The Streaming Tool greatly impacted visa applicants from East African countries (Manji et al., 2019). The "technological redlining" of the algorithms used to dictate mobility rights must consider the pitfalls of the technology used.

Policing algorithms offer the most prevalent research into algorithms' discriminatory functions, described as a feedback loop. Feedback loops were introduced in Chapter Two. To summarise, the algorithm's structure reinforces its outcomes via data inputs. Feedback loops deconstruct how the data used to "train" the algorithm stems from the capturing, harvesting and "cleaning" of social relations (D'Ignazio & Klein, 2020). One of the most prevalent case studies of algorithmic discrimination is ProPublica's research into the risk assessment algorithms judges use to predict the likelihood of defendant recidivism, mentioned previously in Chapter Two. COMPAS is a "risk assessment" that assesses data from the past to predict an individual's future (Harcourt, 2010). The COMPAS algorithm was developed by Northpointe using the data of 10,000 criminal defendants. Researchers concluded that the algorithm was racially biassed against black defendants and inaccurate at predicting the likelihood of recidivism. This algorithm falsely flagged black defendants as "twice" as likely to commit a future crime compared to white defendants. While the defendants' race was not a direct input into the algorithm, the results were racially skewed. Beyond this racially discriminatory effect, the algorithm proved to be inaccurate at predicting the likelihood of recidivism. The accuracy of predicting "violent recidivism" was "correct 20 per cent of the time"(Angwin et al., 2016). As the COMPAS example demonstrates, using inputs in an algorithm dictating risk assessment uses historical data about sentencing to conclude that data on historical policing practice is not neutral, but is embedded in past racial discriminatory structures.

Discriminatory feedback loops thrive on the construction of technologies as neutral. This discussion on the ability of an algorithm to produce racially skewed or incorrect results without the direct input of race will be further explored in this chapter when discussing the replacement of the Streaming Tool. Neutrality appears in the discourse around algorithms in general, specifically in the Home Office's construction and defence of the tool. The varying definitions of the Streaming Tool demonstrate the construction of neutrality placed on the algorithm by the Home Office and inform the first stage of the discriminatory feedback loop in the Streaming Tool. The fallacy of technological efficiency, in combination with inaccuracy in migration governance algorithms, affects people's rights, lives and chances. Harsh categories (Dijstelbloem & Broeders, 2015) are algorithmically determined to situate the experience of individuals at the border as a risk or non-risk.

4.2.2 Definitions of the Streaming Tool

JCWI and Foxglove filed a statement against the Home Office's use of the Streaming Tool as it assigned risk assessments based on visa applicants' nationality. Introduced by the Home Office in 2015, the Streaming Tool has been categorising, analysing, and dictating mobility in the UK using traffic light colours, Green (low risk), Amber (medium risk), and Red (high risk), to signal which applicants required "further enrichment" (Home Office, 2021a). The Streaming Tool was "incorporated into the processing of all visits, transit, EU scheme, a domestic worker and short-term student visa applications" and is estimated to have processed "approx. 2.75 million visits, transit, domestic worker, or EU scheme visa applications" (*JCWI v. SSHD*, 2020, p. 10). According to the Home Office, "the Streaming Tool (was) created and developed in-house by UKVI" (UK Visas and Immigration, 2017, p. 8) The most recent version of the application is called the "streaming app v3.0", the version of the algorithm featured in the court case against the Home Office (UK Visas and Immigration, 2017, p. 8). Visa and Citizenship (VC) is the Home Office subsection that uses the Streaming Tool (Home Office, 2017). Home Office documents and representatives have various definitions of the Streaming Tool, this ambiguity demonstrates the attempts of the department to distance the tool from an algorithm or automation.

The Home Office describes the Streaming Tool as "a workflow system which routes applications to the appropriate grade of decision-maker based on the anticipated level of risk of the application" (Home Office, 2021a). When asked in an Impact Assessment Evaluation if the Streaming Tool is an "automated decision-making with legal or similarly significant effect", the Home Office ticked "No" (Home Office, 2021d). The Home Office's representative, Caroline Nokes, stated in a parliamentary debate that:

> An algorithm is a series of instructions or a set of rules that are followed to complete a task. The streaming tool, which UKVI decision-making centres operate, is an algorithm, but I should make it clear that it is not coding, it is not programming, it is not anything that involves machine learning, and, crucially, it is not automated decision-making. It is an automated flowchart where an application is subject to a number of basic yes/no questions to determine whether it is likely to be straightforward or possibly more complex. As I said earlier, the streaming tool is used only to allocate applications, not to decide them (Onwurah & Nokes, 2019)

The Home Office's definition of the Streaming Tool as an "automated flow chart" but not an "automated decision making" mechanism, all whilst being an "algorithm", points to the inconsistency and lack of knowledge of the executors of the tool. The Home Office rejected the suggestion that the Streaming Tool was discriminatory and claimed that "the final RAG rating does not determine the decision" of the application and that "the tool complies fully with the relevant legislation under the Equality Act 2010"(Onwurah & Nokes, 2019); this was the intention of the Home Office implementing the technology. The Home Office's depiction of the Streaming Tool emphasises that the Streaming Tool does not impact the decision of each application. According to the Home Office, allocation to the correct case workers and a method of organising the flow of visa applications are the defining features of the Streaming Tool. The JCWI offers a contradictory definition of the Streaming Tool.

The Legal Policy Director of JCWI, Chai Patel, said: "this Streaming Tool took decades of institutionally racist practices, such as targeting particular nationalities for immigration raids and turned them into the software" (JCWI, 2020). Patel's statement mirrors this paper's hypothesis that technology perpetuates and reinforces racial hierarchy within migration governance. JCWI and Foxglove defined the Streaming Tool in their legal contention as a "discriminatory automated decision-making algorithm" (*JCWI v. SSHD*, 2020 p.1). The JCWI (2020) insisted that the algorithm "materially affects the scope, depth and substance of their (Home Office caseworkers) decisions" (p.4). This chapter accepts the JCWI's definition of the Streaming Tool as it acknowledges the algorithm as influencing decision-making at the border. Based on the varying definitions of the Streaming Tool, there can now be a discussion on the legal resistance from JCWI and Foxglove against the algorithm.

4.2.3 Legal Analysis

The details of the Streaming Tool and the ultimate decision by the Home Office to scrap the algorithm emerged after the JCWI and Foxglove requested further details on the algorithm. No official legal case was heard in court, but there was a request to the Home Office for transparency on how the Streaming Tool operated. In a document titled "Claimant Statements", the JCWI and Foxglove argue that using an applicant's nationality to produce a risk rating

violated the Equality Act of 2010. The JCWI demonstrated that the use of the Streaming Tool operated in the same direct discriminatory way that the Roma communities faced:

> The perceived risk level of the application and its consequent treatment depends on a generic and stereotypical assessment of the risks said to be associated with applications made by persons sharing the nationality of the applicant rather than on a consideration of the level of risk posed by the specific applicant herself (*JCWI v. SSHD*, 2020, p.14).

Technological interventions with past direct discrimination prove the Streaming Tool operates socio-technically. The legal debate reaffirms that using nationality to articulate risk falls into racialised, bordering practices. Mobility decisions seemingly based on person-based risk assessments are shrouded in racial tropes based on the person's nationality. JCWI first focuses on the discriminatory nature of the higher level of scrutiny that this technology employs towards applicants based on their ethnicity or race (*JCWI v. SSHD*, 2020). The Home Office states that "the differentiation based on nationalities is … justified by security and immigration risk-based assessments of the relative risk that a country's citizens pose to the UK's border and national security. The discrimination level is justified and reasonable" (Home Office, 2021b). Risk and nationality being linked together as a justification for discrimination at the border reveals the need to consider not just the technology, but the sociopolitical elements that emerge from bordering practices. The fluid and opaque nature of the nationalities conceived to be "risky" by the Home Office blur the boundaries of risk as not fixed, but as constantly politically informed. Whilst the Home Office states that its border practices are moving to consider the individual, they offer justification for considering nationality in creating risk.

The litigation team claims that the "Streaming Tool is unlawful on the basis that it is directly discriminatory on the grounds of race, contrary to sections 13 and 29 of the Equality Act 2010" and that race includes both "nationality or ethnic or national origins" (JCWI v. SSHD, 2020, p.13). The JCWI argues that the Streaming Tool was the technological agent working to exclude certain nationalities based on "the stereotyping of applicants holding designated 'suspect' nationalities" (JCWI v. SSHD, 2020, p.15). The JCWI identifies one aspect of discrimination in the visibility power of the algorithm. The algorithm flags certain nationalities as risky, leading to more application surveillance and the likeliness of rejection. The JCWI argued:

> RAG risk rating determines the level of scrutiny (or "enrichment") the application will receive. Green-rated applications are subject to fewer and less intrusive checks. Any refusal to issue a visa regarding a Green application must be reviewed by a Higher Executive Officer or Entry Clearance Manager (ECO). The assumption is that such applications will be granted. Red-rated applications are subject to more extensive checks, and any decision to issue a visa regarding a Red application is subject to a more senior official review. Checks are not required in all Amber-rated applications, but any decision to circumvent the scrutiny "enrichment" process must be justified with reasons (JCWI v. SSHD, 2020, p. 8).

The assumption and acceptance of the risk rating as accurate and trusted allows racialised outcomes to persist. What is deemed "enrichment" in practice can subject applicants of certain nationalities to hyper-visibility. Once an applicant is made "risky" or more visible at the border, the consequences inform their mobility chances and hinder future decisions. This is a feedback loop. The visibility applied to the applicants works as well to reinscribe the power of "institutional racism" onto the body of the applicants through hyper-visibility (Benjamin, 2020). Constructions of risk become the transformation of sovereign power in "taming" unwanted populations based on racially informed categories of threat (Kim, 2012). Links between risk construction, racial bias, and automated tools move forward. As categories become blurred, the treatment of perceived groups of people under the category of threat will be continuously reconstructed in the invisible manner of technology. Could there be an argument that there is a benefit of the codification or programming element of the discriminatory decision-making process?

The Streaming Tool's codification of discriminatory production of risk provided an entry point for legal action against biassed visa policies. As I earlier identified, mobility rights have always been unequal. Borders, visas and passports are all technological entities permutating an unequal global visa regime of movement. To say the Streaming Tool was not reinventing the wheel by discriminating against specific nationalities in the visa decision-making processes. The bureaucratic nature of visa application obscured the racial undertones, but the discriminatory features that the Streaming Tool perpetuated were visible in the programming. Direct input of nationality into the process of visa decision-making was enough legal evidence for the JCWI and Foxglove to file a claimant statement for details on the use of the Streaming Tool. The legal "benefits" of having a codified discriminatory practice, while necessary for resisting the perpetuation of algorithms, are not the focus of this chapter. I highlight the tool's impact on the

East African community. I do so to recognise the harm of the algorithm on individuals' ability to visit, study and live in the UK and to underscore the necessity of not celebrating the codification of discriminatory practices in resisting bias in decision-making, but instead to avoid repeating similar practices.

4.3 Impact of the Streaming Tool on East African Communities

The impact on applicants from East Africa is a concrete example of how technology can be racialised. Returning to Chai Patel's (2020) point of the years of racial prejudice being systemised within the Streaming Tool without notice connects to the findings of the joint All-Party Parliamentary Group Report by the APPG for Africa, the APPG for Diaspora, Development & Migration and the APPG for Malawi. This report highlighted that the "Home Office data on visa refusals shows that African applicants are over twice as likely to be refused a UK visa than applicants from any other part of the world" (Manji et al., 2019, p. 8). The increasing number of rejections of nationals from Africa was cited by the JCWI and Foxglove group to prove the discriminatory nature of the Streaming Tool (JCWI v. SSHD, 2020). The Joint Parliamentary report recalled the story of "Councillor Kate Anolue, Deputy Mayor of the London Borough of Enfield…(who) outlined multiple instances where she has applied for close family members to visit her in the UK (from Nigeria) and visas have been rejected" (Manji et al., 2019, p. 22). Due to the technical uniqueness of visa decision making, we cannot point to immigration status and a proverbial 'smoking gun' to claim that the Streaming Tool is the sole reason for the visa rejections. What is essential to recognise is that from 2016 to 2018, "12% of all visit visa applications made between September 2016 and September 2018 were refused. For the Middle East, the figure was 11%. For Asia it was also 11%. For North America, it was unsurprisingly lower, at just 4%. **For Africa, 27% of visit visa applications between September 2016 and September 2018 were refused"** (I. Halliday, personal communication, 16 July 2019, bold added)

By pairing the criticism of the Streaming Tool with a specific story of a personal struggle of UK citizens who wished to connect with their family for things like birthday celebrations, religious events, or community gatherings and these being unable to happen for vague and unknown reasons situates the actual harm of technology being implemented in immigration

decisions. When discussing such a vast issue, it is easy to become detached from the personal impact of technology and focus on the numerical outputs. However, this standpoint allows governments and corporations to prioritise rationality over emotion and human experience (Broussard, 2019, p.75). The racialised power of technology contains intersectional oppressions that produce discriminatory systems (Hill Collins, 2009). These factors include economic, religious, sexual orientation, gender expression, and nationality, to name a few. Therefore, the Streaming Tool produces not only racially discriminatory outcomes, but intersects with patriarchal structures as well. As Councillor Kate Anolue (Manji et al., 2019) expressed her frustration with visa application refusals for unknown reasons, the Joint Parliamentary report highlighted how women and men were treated during the application process. The report found:

> In some cases, the reasons given for rejection reflect a different standard applied to female applicants compared to men, with additional and sometimes discriminatory evidence seemingly requested. Other applicants also perceived racial discrimination in some of the assumptions underlying reasons for rejection. These give the impression that the 'hostile environment' is extended into Africa (Manji et al., 2019, p. 9)

Crucial from the above statement is the recognition that the racial discrimination of visa applicants denotes an expansion of the Hostile Environment. I build upon the recognition of the expansion of the Hostile Environment and explain that the ability to disperse this hostility is in part attributed to digital technologies. My argument and purpose for selecting the Streaming Tool as a case study is to introduce how technology is poised to reinforce and replicate social biases. What is vital about the Streaming Tool is not that it has been successfully "scrapped", but how the conception of the tool reveals the emerging reinforcement blocks of the *Digital* Hostile Environment. To understand the ability of the Streaming Tool's logics to remain infrastructurally within the Home Office, I now move to deconstruct the technical elements of the algorithm.

4.4 The Streaming Tool's Technical components

To counter the notion that the codification of discriminatory results via an algorithm may benefit future equality, I turn to the technical components supporting the function of the Streaming Tool by unearthing the casework system and database which connects the Streaming Tool to the more expansive sociotechnical infrastructure of the Home Office. I aim to renegotiate the claim that the Streaming Tool has been 'scrapped'. Just as a car is sent to the junkyard to be

‘scrapped’ for parts, the Streaming Tool parts are shined, repainted and recast in new tools. As identified above, the Streaming Tool does not operate in a socio-political vacuum but as a component of a more extensive relationship of border politics. There can now be the same contextualisation that the technical features of the Streaming Tool are connected to other digital technical systems. First, there is an overview of the Proviso software-the interface in the Home Office in which workers record notes and decisions. I then cover the data used to construct the risk profiles, nationality, and the case working database. By examining these technical systems, I can further argue that the Streaming Tool's legacies, standards and procedures remain present in the digital infrastructure of the Home Office.

4.4.1 The Software Proviso

To contextualise the effects of the Streaming Tool, this chapter first delves into its technical logistics. The software Proviso is a “distributed Visa Case Working application” (Home Office, 2014). Proviso links online visa applications with Croydon and Sheffield's Home Office visa processing centres (Singh, 2019). Visa decisions are “recorded” (5), and Proviso begins the “streaming” of a visa application. The RAG rating created from the streaming process will be recorded in Proviso. The data feminist principle to “consider context” urges the deconstruction of the actors present in discipline data-that is to say, people who transform “information (to be) made tractable” (D'Ignazio & Klein, 2020, p. 103). One method to understand how the information put into the Streaming Tool can be transformed into knowledge that can be controlled is to look at the interconnected systems of the algorithm. Below is an image of how the final reports of the Streaming Tool are saved.

Figure 5: Question Tree from Streaming Tool

OFFICIAL

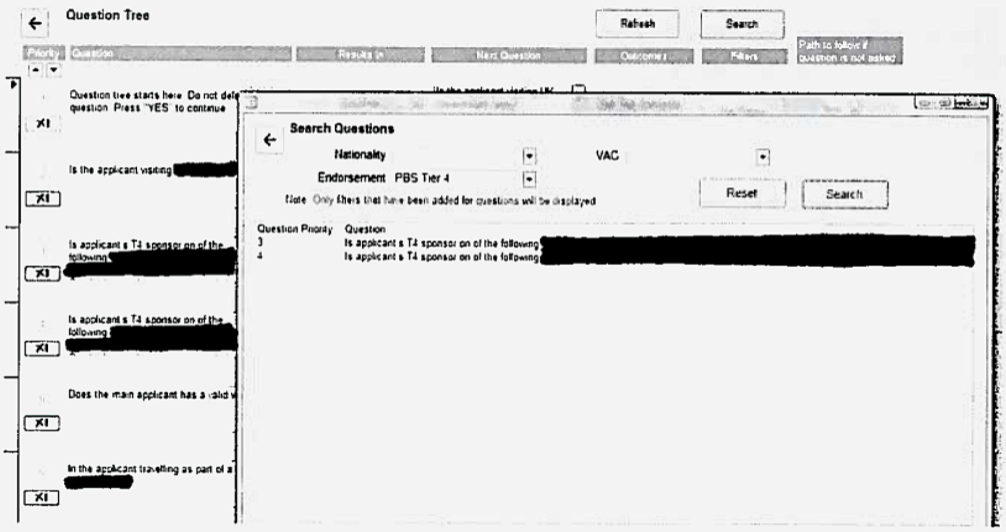


Figure 25: Streaming App v3.0, search for questions

Delete a question:

To delete a question, select a question and click the delete button.

If the question is not linked to any other question, a delete confirmation message will show up.

If the question is linked to other questions, a list of links will show up. You can export the list to MS Excel for reference. You will need to remove all links before the question can be deleted.

Note: Do not use the delete key on the keyboard to delete any question. This can break the links between questions.

The Proviso system "feeds back daily" to the Central Reference System (CRS). As of 2006, the CRS system is described as containing the "full details of visa applications submitted at UK missions abroad. UKIS Border Control operational staff have access to this system at "back office" terminals at ports of arrival" (Byrne, 2006). I highlight the connection of Proviso to foreground the need to consider border technology infrastructurally. Proviso is the main system that connects visa centres abroad to the Home Office's decision makers domestically. First steps of the Streaming Tool include the uploading of documents by case workers onto Proviso. I mention the Proviso system as there is the continuation of this software in the replacement Streaming Tool, discussed below, and to introduce the complexity of the socio-technical network in which the Streaming Tool operates. A brief consideration must be made of how the software of Proviso connects to cloud computing.

In the “Data Protection Impact Assessment (DPIA)” for the Streaming Tool, the Home Office articulated that “data is not stored, shared, moved or transferred as part of the streaming process. The Streaming Tool is not networked or shared via the web. The result of the streaming process is recorded in the Proviso case working programme” (Home Office, 2021). The Home Office claims the Streaming Tool did not operate in a feedback loop; however, by connecting the streaming process to the risk profiling process conducted on Proviso, the use of historical data becomes more precise. I move now to explore how the Proviso software stores data; the Streaming Tool can be considered via a feedback loop connected to cloud computing.

The Home Office refused to answer my FOI request asking, “Can you please confirm the use of cloud-based databases (MS SQL) which are being used to manage Proviso?”. The Home Office responded:

> I can confirm that the Home Office holds the information that you have requested on the use of cloud-based storage and the use of cloud-based databases. However, after careful consideration, we have decided that this information is exempt from disclosure under section 31(1) of the FOIA. This provides that information can be withheld if disclosure would prejudice law enforcement and if the public interest falls in favour of maintaining the exemptions (Home Office Enterprise Services, 2021).

The above response leaves this chapter to hypothesise about the specific power relations emerging from undisclosed uses of cloud computing. My inquiry into Proviso came from past FOI requests about the actors involved in managing the technical infrastructure of the Home Office (Home Office, 2014). Out of the seven different programs the Home Office uses, Proviso is the only one listed as “maintained” by a UK public agency, the “Foreign and Commonwealth Office Services (FCOS)”: the material elements of the various “software elements” the connection of Proviso to cloud computing appears. In the Home Office's disclosure, there was an acceptance of the use of “cloud-based storage and the use of cloud-based databases”, but the “black box” was placed over the specific details of the subscription used by the Home Office. The “black box”, as articulated by Pasquale (2016) and Chun (2009), the logics in machine learning that are unknown to the public and programmers. Expanding the notion of the “black box” as a construction of obscurity can offer a new source of knowledge by suggesting what is “black boxed” as a configuration for possibilities, links and hypothesised infrastructural

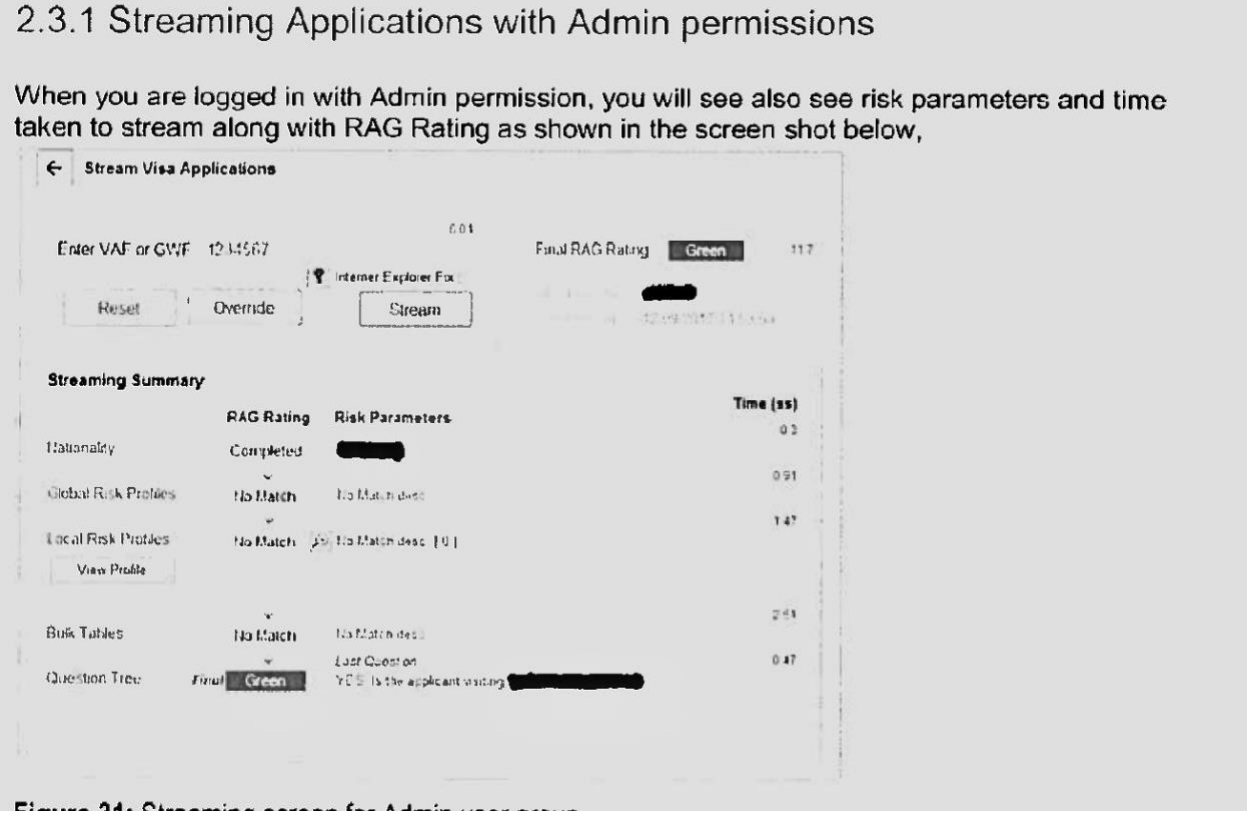
constructions. The claim of the Home Office to accept cloud computing suggests that revealing this information passes the "public interest test" while the provider of the computing does not.

Proviso, the software of the Streaming Tool, opens the tool reveals the more extensive, technically opaque features of the algorithm. Embedded in the infrastructure of the Streaming Tool is the database used by the Home Office. From the deconstruction of the software that supports the Entry Clearance Officers (ECO) in the decision-making process, there is now a move to consider the data sources, and how the casework management system contributes to the functions of the Streaming Tool.

4.4.2 Data Sources and the Case Management Database (CID)

One data source the Streaming Tool draws from is "the Global Visa Risk Streaming (GVRS)…which is used worldwide, ensuring a globally consistent and evidenced-based approach to streaming. This ensures that regardless of application location, the process, the pre-decision activity and requirement for management review is standardised" (Home Office, 2021a). Information about what or how this "globally consistent data" is cumulated is not revealed. Another data source for the Streaming Tool consists of "local risk profiles" (Home Office, 2021b). Below is a image of a summary of the streaming results (Home Office, 2017a):

Figure 6: Nationality Input for Streaming Tool



The ICIBI (2018) reveals the creation of local profiles of risk drawn from data on the "nationality of the applicant (and) all immigration harm data collected globally by Immigration Enforcement over the preceding 12 months and attributable to particular cohorts of applicants, attributes from local risk profiles (for example, the applicant's occupation, sponsor)" (p.31). In a noisy cafe in central London, I sat down with a barrister (who wishes to remain anonymous) from the JCWI legal team. When I inquired about the local risk profiles and GVRS, the unnamed barrister answered with their hypothesis about the dataset. They responded:

> "I imagine. That is just another way of getting some nationality, concealed nationality criteria … Well, you might say that we will not discriminate against people from Afghanistan. But there is a local profile: people who live in the following areas because of political changes, that particular level of political unrest. So instead of just saying we are going to discriminate against Afghans, what they say is we are discriminating against people with a particularly high level of risk" (Anonymous, personal communication, December 1, 2021).

As the unnamed barrister mentions, these datasets have hidden features that skew the data to discriminate against nationalities deemed "risky". While these datasets may not have the capacity to be "transparent, they should be at least translucent", as it is these sets that are training

the Streaming Tool. When the legal team of JCWI inquired about this data, they were given heavily redacted information (Anonymous, personal communication, December 1, 2021). The JCWI legal congestion mentions that visa cases and the possibility of nationality are factors in the production of risk profiles at multiple stages of the streaming process (JCWI v. SSHD, 2020). By considering the more covert features of the Streaming Tool, nationality can be discerned as a factor in risk. Considering the other data sources that were used to inform the Streaming Tool's ratings of risk deepens the appreciation for how algorithmic processes involve layers of sociotechnical tools. Beyond using other data sources, the Streaming Tool is connected to the Home Office caseworking management system.

Operating since 1998, the CID was the case management database for the Home Office (Immigration Technology Portfolio, 2020). The CID is an "application … used by UK Visa Immigration and Border Force to support the administration of all Asylum, General Settlement and Nationality applications. It contains details of all non-British Nationals that come to the attention of the Immigration Service. Approximately 15,000 users use the system"(Home Office, 2014b). The CID stores the data used by the Streaming Tool. Embedded into the database are sociopolitical negotiations. Critical data scholars argue that databases are to be understood as "relational entities" as they are both shaped by the world and "shape the world" (Kitchin, 2017, p. 129). Kitchin (2021), a geographer, insists that "database design is not predetermined; rather, databases evolve in their construction to hold certain kinds of data and perform particular queries and analysis" (p.65). Included in Kitchin's (2021) conceptualisation of databases is a reminder that embedded into the design of databases are the "intents" of actors who are shaping the "power/knowledge" relations of who is "silenced and remembered" and what data is connected to other sources. Alongside databases being understood as "expressions of power/knowledge" that shape relations, Kitchin (2021) argues for deconstructing the design of digital technologies. Similar to Proviso, CID contains software constructed by private actors.

I problematise the use of facial recognition software in the case working system to further argue that the infrastructural lens deconstructs the technical process and standards and contributes to a richer investigation of how racialised bias can be embedded into digital tools. CID uses a facial recognition software, FaceVACS (Home Office, 2014) developed by the German company Cognitec. The Home Office has been known to implement facial recognition

technology, knowing the technology was racially biased (Vaughan, 2019). Insight into how Cognitec views its technology reveals details of the sociotechnical arrangements present in the CID.

The reason is unknown as to why the CID uses a service described by the technology producers as "powerful face localisation and face tracking on images and video streams, industry-leading matching algorithms for enrolment, verification and identification accurate portrait characteristics check for gender, age, pose deviation, exposure, glasses, eyes closed, uniform lighting detection, unnatural color, image and face geometry" (Cognitec, 2019). Cognitec's (Cognitec, 2021, p. 2) "White Paper" demonstrates how they run their in-house test using "US Mugshots" as their testing data, indicates that "black females show relatively higher False Match Results (FMRs) when using the whole data with the same matching threshold. Overall error rates are reasonably low" (Cognitec, 2021, p. 2). Cognitec's (2021) argument for the efficiency, neutrality and benefit of their technology rests upon the fact that skin colour is not a "direct input" into their facial recognition system. However, skin colour not being a direct data input fits into the pattern of algorithms using other data points for a "proxy" to result in biased outcomes (Benjamin, 2020; Harcourt, 2010). There is a degree of secrecy surrounding the private actors' technological solutions.

Joe Tomlinson, co-author of *Experiments in Automating Immigration Systems*, talked through some of his thoughts about private actors in our interview on February 24th, 2022 via Zoom. He noted that the role of private actors is:

> sort of hidden … But I think the two main points I have on it are beyond that one. My sense is that the private actors are doing two things in this, just across the government. I have seen in tech, at least in the central departments, Home Office, Justice, etc., that they are doing two things. They are providing off-the-shelf type products that they can then adjust and sell to the government. Alternatively, they are providing something which is not strictly technology but has a technological sheen, a kind of like design service, like user experience. People are obsessed with user experience design for the government because they think they are wielding. They will tell you they do not influence policy people. However, this class of civil servants, of user experience designers or agile designers, [has been] massively funded in the last ten years. And you know they have a degree of power (J. Tomlinson, personal communication, February 24 2022).

This thesis will further examine the two facets of private actors, in Chapter Seven. Tomlinson (2022) signals the need to engage critically with the power dynamics embedded in the technologies' network in migration governance. User experience and private consultancy about the construction of technologies remain clandestine; Tomlinson (2022) flagged that even programmes like the European Union (EU) Resettlement Scheme, government actors have been more transparent about, still have hidden or not noticeable private actors. The private actors in the Streaming Tool's infrastructure are not considered in the legal case against the algorithm. Unearthing the use of facial recognition in the case management system clarifies how the Streaming Tool is one component of a larger sociotechnical infrastructure that is poised to produce racialised results. From the deconstruction of the FACEVACs software, there can now be a more comprehensive consideration for how complex the networked features of the Streaming Tool are in creating a feedback loop.

4.5 Feedback Loops

The JCWI emphasised that the Streaming Tool was self-perpetuating, meaning that the more certain nationals are rejected, the more the algorithm would continue to reject the same nationality (JCWI v. SSHD, 2020). Algorithms are "taught" to make decisions based on a mathematical formula to achieve the best decision with minimal errors; this data is considered neutral and free of human biases, but this is a dangerous and incorrect assumption (Broussard, 2019). JCWI and Foxglove's litigation team argue that the general function of algorithms would lead to further discrimination through negative feedback loops. In an interview about the win against the Home Office, Cori Crider, founder of Foxglove, said:

> We are delighted the Home Office has seen sense and scrapped the Streaming Tool. Racist feedback loops meant that a fair migration process should have been just 'speedy boarding' for white people. What we need is a democracy, not a government by the algorithm. Before any other systems get rolled out, let us ask experts and the public whether automation is appropriate and how historic biases can be spotted and dug out at the roots (JCWI, 2020).

Crider (2020) flags the "racist feedback loop" and how the Streaming Tool operated in practice rather than focusing on what the Home Office intended for the algorithm. Maxwell and Tomlinson (2022) link the technical components of an algorithm combined with the extra

scrutiny placed on applications based on automated decision-making as discriminatory. Maxwell and Tomlinson (2022) claim:

> The refusal of a visa application constituted an 'adverse event' to determine whether a particular nationality would be targeted for additional scrutiny. But if certain nationalities were subject to additional scrutiny, this would naturally lead to a higher rate of refusals for those groups, thus making it more likely that they would continue to be treated as suspects. The Streaming Tool's outputs and underlying data were unintentionally linked, reinforcing the other in a manner detached from the actual incidence of immigration breaches… Then, as now, risks of skewed data and feedback loops undermined the Home Office's attempt to use immigration statistics to target particular nationalities. The persistent appeal of a more 'objective', targeted approach to immigration control is matched by persistent problems with the underlying data (p.60)

The more certain nationals are flagged as risky and thus denied, the more likely future applicants from that nationality will be rejected. Whilst legal scholars found the similarity between the use of "statistics" and the use of technologically "objective" tools producing racialised feedback loops as striking, critical data scholars would argue that this is not striking at all (D'Ignazio & Klein, 2020). As minority communities face more data collection, extra scrutiny and surveillance will continue a "feedback loop of injustice", and this will reinforce their "marginality" (Eubanks, 2018, p.10). The algorithm's materiality is posed to perpetuate feedback loops.

Joshi highlighted during the book launch for *Experiments in Immigration* that the data used in the Streaming Tool needs to be examined structurally rather than through the lens of just reform (cited by Kazim, 2022). Origin, quality and proportionate concerns for the data used in the Streaming Tool were all raised by Joshi (2022) to push forward the notion that algorithms system scale and formalise existing bias. Chouldechova (2016) questions whether algorithms assessing risk can achieve a "fair result" as risk is a social phenomenon. Researchers conclude that risk assessments are racially biassed, mainly when predicting a crime, because "risk is predominantly tied to prior criminal history, and prior criminality has become a proxy for race" (Harcourt, 2010). Data feminists insist on contextualising data to understand the "social, cultural, historical, institutional, and material" context of how the knowledge of technology was produced (D'Ignazio & Klein, 2020, p.152). This context can be seen in the immigration practices that become the data for the Streaming Tool. The flow between law enforcement and digital discrimination can be seen in the targeting of "overstayers" by the UK policing in specific ethnic communities (*JCWI v. SSHD*, 2020). Police and immigration officers "targeting" these

communities led to “Bangladeshis, Indians and Pakistanis ma(king) up over 50% of all arrests made on illegal working visits. Together with Chinese, four nationalities accounted for almost two-thirds (63%) of such arrests” (p.16). Racial targeting leads to higher removal rates of certain nationalities and subsequently makes up the training dataset for the Streaming Tool. The many instances of racial prejudice in policing and immigration are present in the “determinations of alienage, and lawful status is likely to be dictated and mediated by racial, cultural and class stereotypes—like 'looking foreign', having a 'foreign-sounding' name, speaking broken English or without an English accent” (Aliverti, 2014, p. 223).

Risk as a proxy for race articulations further problematises the practice of the Streaming Tool, automating the process of accessing visa applications. Risk and race were the fundamental components of the Streaming Tool, with race being the input and risk being the output. Connecting these two concepts as co-constructive further reinforces the feedback loop introduced in the algorithm. The Streaming Tool worked in the discriminatory knowledge practice of risk and race to create a self-fulfilling structure for over four years, with no oversight or visibility of the practice to the public or visa applicants. Primarily, the legal case problematises the power of visibility, informed by racial logics, produced by the Streaming Tool.

4.6 What has been Scrapped from the Streaming Tool

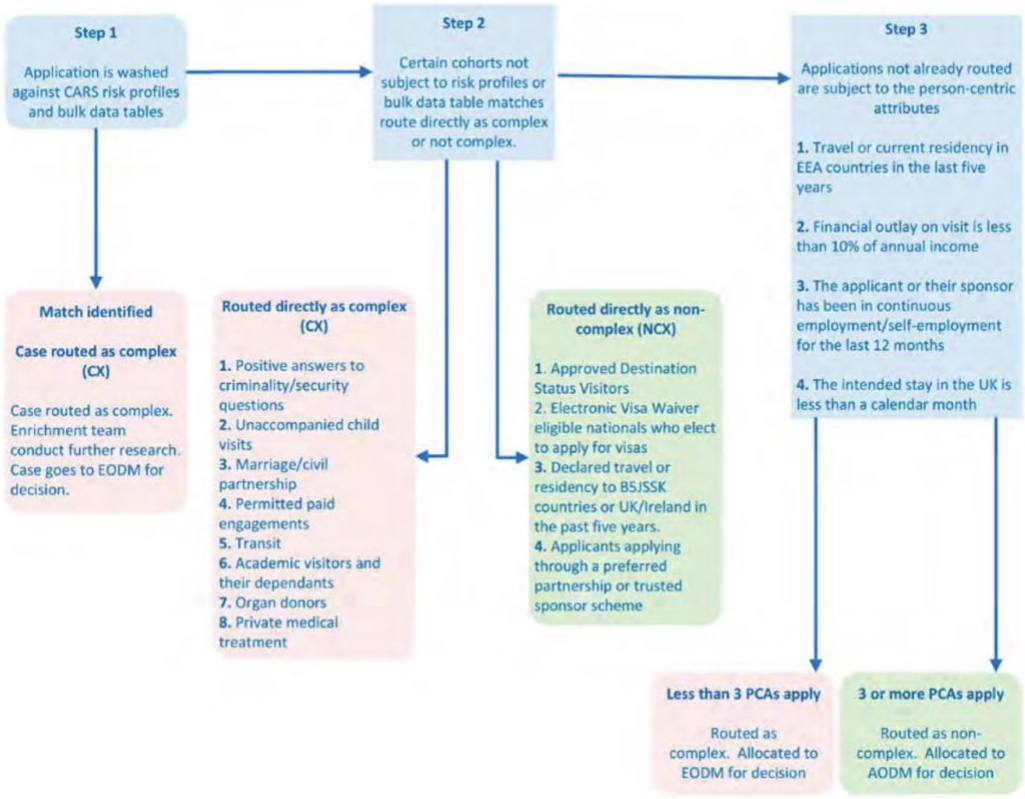
In a letter to JCWI, the Home Office stated they would “discontinue the Streaming Tool” (JCWI, 2020). The Home Office claimed that the “redesign” of the system to assess applications would consider the points raised, such as “unconscious bias and the use of nationality”; however, they were clear that this restructuring did not mean they accepted the discriminatory claim made against them (JCWI, 2020). McGurk(2022) signalled that the redesign of the visa tool announced by the Home Office is “highly likely to be a more personalised risk-profiling” tool; however, this system is not a “panacea … and designers may encode indirect or direct invidious forms of discrimination by using facially neutral criteria that are actually for characteristics like nationality or other protected characteristics” (Public Law Project, 2022, p. 7). This warning and concern speaks to this chapter's hypothesis, that the Streaming Tool's discriminatory nature is not only present at the surface level but deeply embedded in the digital infrastructure of the Home Office. Repealing the Streaming Tool is a legal victory to resist algorithmic decision-making in

public governance. Beneath the surface of technological neutrality, the Streaming Tool acts in a discriminatory way to reinforce, conceal and replicate past migration patterns. Home Office officials promise to safeguard against confirmation bias and nationality in a de-facto risk assessment. Is this enough? The Home Office implemented a new tool, "interim workflow routing solution", and seemingly redesigned the colour-based risk assessment but did not include safeguards against bias emerging from datasets (Home Office, 2021). The need to consider the Streaming Tool through an infrastructural lens is validated by the failures of the replacement design's visa algorithm.

The current information on the replacement tool, at the time of writing in the spring of 2024, is limited but has a clear pattern of being designed to obscure the practice of considering nationality in risk ratings and has technical failures. The most prominent change in the revealed information about the replacement tool for the Streaming Tool is that there is **no direct** input of nationality. The Home Office describes the new tool rolled out, "Complexity Application Routing Solution (CARS)", as an "automated tool" that dictates the level of Home Office employees reviewing an application. The difference between the Streaming Tool and the CARS tool nationality is not a direct input, but the purpose of the two systems is strikingly similar; both tools dictate the level of scrutiny of visa applications, log decisions on Proviso and use an automated feature to construct risk. An overview of the process of CARS is below.

Figure 7: Process for the Complexity Assessment Routing System

Figure 3: Overview of the operation of the CARS system[27]



(Neal, 2023, p. 9)

Those who claim that technologies codify, log, and systematically catalogue discriminatory practices, thus creating a new mode of resistance, do not consider the infrastructure supporting the tool in question. In the case of the legal win against the Streaming Tool, with a change of the system *directly* inputting nationality, there were ad hoc provisions that drew on nationality in producing risk profiles in an ambiguous manner. A ICIBI (2023) observes that the new system emerges from the concern about the use of nationality as a direct input, yet the redesign of the tool introduces the use of proxy factors that may discriminate based on protected characteristics. Legacies of the Streaming Tool are identifying the continual use of Proviso to log decisions, and gives access to the case workers to change "risk outcome" (Neal, 2023). The Home Office instructs "Visit's operations must ensure they classify application complexity by using "Change risk rating" in Proviso and selecting the appropriate complexity routing. The user must record the change reason as "**outcome of Streaming Tool"** (Home Office, 2023, p.11,bold added). In the

process of changing risk rating via Proviso, the Home Office replacement tool bares the legacies of the Streaming Tool. As the name of the outcome is still the Streaming Tool, their process for which discriminatory results may occur is more complex.

The CARS tool's use of "direct searches" to track all applications based on place raised concerns by Home Office staff and the ICIBI that there would be "language mistakes" based on differences in alphabets between the applicant's native language and English (Home Office, 2023,14). There is a Ministerial Authority for increased scrutiny (Foster, 2021) towards applicants of a preapproved nationality list. Another layer of automation is introduced into the process or risk, and searching applications, as the ICIBI reports the "out the use of a new Microsoft Access Database, which added a degree of automation to determine the complexity of the application. This tool uses a look-up function to identify pertinent application data from the Proviso system to assess certain attributes against a series of indicators of application complexity" (Neal, 2023, p.8). Present in the replacement tool is a continual ambiguity for how the Home Office are using proxies, or filters, to sort, rank and construct a hierarchy of migration cases. In reflection on how Foxglove and JCWI's legal challenge of the Streaming tool shaped the process of the tool's redesign, one senior manager said: "it's not a choice whether to comply with the Equality Act" (Neal, 2023, p. 16). The manager was confident that the process complied with the requirements of equality legislation, describing it as "legally bulletproof" (Neal, 2023, p.15). Prominent here is the ad hoc nature of "fixing" digital tools to work in a manner that does not directly discriminate but reinforces a more obscure means of reinforcing bias. Below is a sample of the Equality Impact assessment of the CARS system:

Figure 8: Bias in the Complexity Assessment Tool

Figure 6: Breakdown of potential direct and indirect impacts identified in equality impact assessments in the 10 sampled by inspectors

	Race		Age		Sex		Marriage/ CP		Maternity		Gender reassignment		Disability		Sexual orientation		Religion	
EIA	D	I	D	I	D	I	D	I	D	I	D	I	D	I	D	I	D	I
1	●	●		●		●		●										●
2	●	●				●		●		●		●		●		●		●
3	●	●		●		●		●										●
4	●	●	●	●		●		●										●
5	●	●	●			●				●		●		●		●		●
6	●	●	●			●						●				●		●
7	●	●				●		●		●		●		●		●		●
8	●	●		●		●		●										●
9	●	●	●			●		●		●		●		●		●		●
10	●	●	●			●		●										●
	10	10	5	4	0	10	0	8	0	4	0	5	0	4	0	5	0	10

D: potential direct discrimination
I: potential indirect discrimination

Present in the random sample of ten cases processed by the reporting team is a prominent case of indirect bias that can form from using CARS. The chart above shows that in the visa process, for all ten cases, there was possible indirect discrimination for race, sex and religion (Home Office, 2023, p. 15) The ICIBI noted that the Home Office should not lose sight that sex/gender indirect discrimination misaligns with the ability to decide visas on a case-by-case basis (Neal, 2023, p.15). Present in the report is a concern for the administrative staff's understanding of the impact of equality and automation, for the primary source for the administrators on the harms of statistics was Wikipedia (Home Office, 2023, p.20). I include the preliminary findings on the replacement Streaming Tool to reinstate the theoretical and practical need to consider digital technology infrastructurally. The removal of the Streaming Tool did not mean the issue of digitally perpetuated harm stops, for the developers, users and administrators using the tools remain in place. What emerges from an overview of the interim system is the infrastructural longevity of the logics of technological bias. Another emerging theme from redesigning the Streaming Tool is the Home Office pattern of using technologies that do not work. Noted by the ICIBI(2023) the caseworkers have “little faith” in the CARS systems and have a dedicated inbox to report the glitches. The relation of faulty technologies used by the Home Office will be explored in Chapter Six on the development of ATLAS, yet essential to

note here is that glitches in technologies lead to work around by the users, their systems of data keeping, are not regulated. Cori Crider (2024), head of Foxglove, states “the fight continues” as the JCWI and Foxglove legal teams prepare for another legal challenge pending the Home Office’s delivering crucial documentation on “how the new system works” (p.68)

The reinterpretation of the Streaming Tool demonstrates the need for an infrastructural lens to unearth the *Digital* Hostile Environment. As the process, standards and precedents of visa decisions have been maintained, the algorithmic tool has simply been redesigned. There are no codified racialised or discriminatory outcomes for legal scholars to use as a basis for a case. However, there is a pattern of applying automated features that use proxy features to continue the pattern of racialised results. A Home Office administrator (Home Office, 2023) describes the CARS as now “legally bulletproof” regarding the standards of the Equality Act. By redesigning the CARS not to include nationality as a direct result, as this was successfully challenged as racially discriminatory, the tactic of the Home Office appears to make the process of considering race more technically opaque. The technical opaqueness of the means is demonstrated in the recognition that *indirect* discrimination is “justified and is a proportionate means of pursuing the legitimate aim of ensuring the overall integrity of the immigration system” (Home Office, 2023, p.5). Justification for indirect uses of nationality or other protected characteristics incorporated into a digital system is a central pattern this thesis emphasises. For the continuation of operating technologies with a known indirect discrimination feature, having technical “glitches” produces the function of non-functionality. The racialised consequence of the Hostile Environment, retracting invoking and internalising borders, produces a functional ability to discriminate through the violence of bureaucracy. The same practice of violence and incompetence is exported to technologies like the Streaming Tool, which functions to create a *Digital* Hostile Environment.

4.7 Conclusion

This chapter explored the digital infrastructure of the Streaming Tool with a Data Feminist methodology to contextualise the knowledge structures embedded in the algorithm. The technical analysis argued that the initial examinations and definitions of the Streaming Tool needed to be more comprehensive to grasp the depth of the power relations formulated by the

algorithm. Based on the argument that the Home Office's construction of the Streaming Tool is a neutral and non-automated entity, it depicts the lack of knowledge of the executor of mobility technologies. The Home Office rhetoric argues for implementing technology under the protection of techno-solutionist statements of efficiency and unbiased decision-making. In the discussion section, this techno-solutionist narrative projected by the Home Office was dismantled and used to prove that the Streaming Tool furthered a racialised feedback loop. Not disclosed in the tool's initial research, various private actors are present in the Streaming Tool's infrastructure, signalling the necessity of the technical lens used in this chapter.

The algorithm perpetuates a racialised feedback loop of the Streaming Tool, the bureaucratic infrastructure of Home Office decision-making, and the influence technology has over human agents. The infrastructural lens applied to the Streaming Tool proves that understanding the nuanced decision-making processes in migration governance requires a technically contextualised approach. Future tools, databases and technologies are poised to replicate and reinforce the discriminatory patterns from this technical research. I use the replacement algorithm of the Streaming Tool to demonstrate the legacies of the algorithm and how they are reimagined, reinforced, and replicated in an increasingly technically opaque manner. With the technical infrastructural analysis, the nuances of how the Streaming Tool algorithm related to biassed visa decision-making could be fully realised. The next chapter further explores the harms of algorithmically produced risk ratings for visa applications by examining the Sham Marriage Tool.

Chapter Five: Sham Marriage Algorithm

The case study of the Sham Marriage Algorithm, the name coined by the Public Law Project (PLP), demonstrates the reinforcement of discriminatory tropes by the Home Office in worthy love matches. The Sham Marriage Algorithm risk assesses marriage applications submitted to the Home Office based on traffic light colours: red, amber and green (Kazim, 2021). This chapter shifts the focus from the external border—the Streaming Tool of the previous chapter—to consider the internalisation of border checks, agents, and surveillance and features of UK public life mediated via automated means. Sham Marriages, as they are now defined, are codified in the Immigration Acts of 2014 and 2016. Once called a Marriage of Convenience, in the 1999 Asylum Act, the UK described this practice as a non-national of the UK and, at the time, EAA that entered a marriage or civil partnership with a UK national for "the purpose of avoiding the effect of one or more provisions of United Kingdom immigration law or the immigration rules" (*Immigration and Asylum Act*, 1999). This definition shifted in 2014 to "anyone wishing to marry in the UK, citizen or non-citizen, needing to give 28 days notice before they are allowed to marry" and introduced a "70-day period that may be placed on marriages" if the Home Office needs "more time to assess" the couple (Home Office, 2013b). The Sham Marriage algorithm intervenes in deciding whether applicants can marry within 28 days or if they must wait 70 days. Due to the UK's leaving the European Union (EU), there is a secondary amendment to the definition of Sham Marriages to capture the new subject of EU citizens with pre-settled status in the UK (Home Office, 2021b).

At the time of this writing, there is ongoing legal action pursued by PLP to gain more information on the Sham Marriage algorithm. When research on this tool began-data collection started on June 7th, 2022- there was no open-sourced data about the Tool aside from two FOI reports. As there may be more technical information about this tool after the publishing of this work, the purpose of this chapter is to examine how the process of determining the genuineness of love between partners is becoming automated. In this context is the dispersal of the border into the intimate lives of citizens and non-citizens (as one partner has legal status to reside in the UK) and the articulation of genuineness through automated means.

This chapter first provides an overview on the legal context of sham marriages in the UK. I then move to introduce how Wemyss, Cassidy and Yuval-Davis (2018) and D'Aoust (2013)

connect historically biased practices and technological readings of the enforcement of sham marriage investigations in the UK. I build on Wemyss and colleagues (2018) and D'Aoust (2013) to argue marriage and love have become a technology to govern, discipline and hierarchise populations within the UK. I then trace the connections between the past practice of what D'Aoust (2013) calls "love as a technology of control" and the present digital tool to argue that the *Digital* Hostile Environment is poised to invisibilise and reinforce historical structures. From the literature on the practice of disciplining sham marriages in the UK, I provide an overview on the framing, or discourse, on sham marriages in the UK. This section reveals the threat the Home Office believes sham marriages present to the security of borders. From this grounding in the literature and UK discourse on marriage migration, I then explore the technical features of the Sham Marriage algorithm.

The known inputs of the Sham Marriage Algorithm codify past discriminatory practices, and the black-boxed nature of the algorithm demonstrates the invisibilisation of the new "moral gatekeeper" of intimacy power in the UK (Wray, 2006). The three known inputs of the Sham Marriage algorithm are: the shared travel history of the couple, the age difference and notes from their interactions with marriage registrars. The other five inputs of the risk assessment algorithm are unknown. The Sham Marriage algorithm reveals how discriminatory effects towards certain nationals can occur without a *direct* input of race; this empirical finding uncovers the process of racialisation, particularly of European migrants. The discussion section of this chapter concludes and reinforces the findings of the Streaming Tool chapter: that the combined logic of this Sham Marriage algorithm intersects with the socio-political desire to hierarchise, filter and rank migrants internally within UK society. This case study reveals how the *Digital* Hostile Environment is maintained internally through automated decision-making algorithms designed to reinforce past migration patterns.

5.1 Legal Context

The legal frameworks of the UK inform the technical infrastructure of the Sham Marriage algorithm. The two principal Immigration Acts 2014 and 2016 shape marriage migration management. In 2014, registrars were required to report if they suspected a marriage was fraudulent (Home Office, 2013b). Registrars fill out what came to be known as Section 24 reports. This practice began in the 1999 Asylum Act, which required that officials be informed of suspected fraudulent marriages. The 1999 Asylum Act formalised the data-sharing process

between members of the public sphere, ministers, church officials, marriage registrars and the Home Office (Wemyss et al., 2018). This position shows that data sharing is not unique to the Hostile Environment, nor is the use of technology used to risk assess these historical marriage processes. What is new is the transformation of the technology to combine past inputs, informed by past social relations, into a codified automated system. This automation, D'Aoust (2013) argues, transforms the meaning of "love as technology" based on Foucault's definition to a dispersed and more efficient digital tool for controlling diversity and intimacy.

Introduced in the 2016 Immigration Act are the new considerations for EAA nationals applying to marry a non-UK citizen and settle in the UK. Again, this is not to say that EAA nationals have not always been perceived as a constructed threat by the Home Office for using marriage to surpass immigration controls. Still, the new law informs the new gaze directed at EAA nationals with the settlement status. The new legal context of EU citizens amplifies the risk of reinforcing the racialised EU migrant when race is "institutionally" practised to structure social relations (Fox et al., 2012), demonstrating the fluidity of racial categorisation. The Home Office (2021) in the year of "2019/20 the MRAU received 16,600 notifications of marriages involving a non-EU/EEA national. 15,301 did not have their notification period extended while 1,299 were extended under the scheme" (p.5). From the 7.81 percent of applications extended under the new automated scheme, the results were proportionally skewed towards EEA nationals. Heightened surveillance towards EAA citizens is seemingly reflected in the outcomes of the Sham Marriage Algorithm; which disproportionality, "red risk assess" the nationalities of "Greeks, Bulgarians, Romanians…" (Public Law Project, 2023). The outcomes of the Sham Marriage technology flagged these nationalities, without any direct input of nationality into the triage system. This example offers an example of how technological infrastructure carries the material and social implications of their settings. This provides a new lens on the racialisation and particular gender dynamics emerging from this automated tool. Ultimately, foreign individuals' legal norms, decisions and marriage applications offer a specific moment when the notions of belonging and the dichotomy of "us and them" become normalised through the bureaucratic method of deciding the validity of love.

5.2 Discourse on Sham Marriages in the UK

Attention to the possibility of individuals using marriage as a means of circumventing migration regulations is constructed through gendered, racialised and classist discourses. Before

there can be a theoretical connection between the use of algorithmic decision-making to produce risk ratings on the application between UK and non-UK citizens, there needs to be a consideration of the UK's discourse marriage migration. The current practice of controlling marriage permission generates "bureaucratic ignorance" (Borrelli, 2018) because it conceals the violence of formalising the conception of genuine relationships. The Home Office works to construct the practice of marriage to gain immigration status as a threat to the UK border system.

Surveillance towards migration through marriage was internalised inside the state before the Hostile Environment policies and has relied on racialised conceptions of genuine love. Simply put, the UK reinforces the idea that sham marriages are "a significant threat to UK immigration control"(Home Affairs Committee, 2014) . The statement by Keith Vaz MP, Chairman of the Committee on Sham Marriages captures the formulation of the threat by the Home Office "there is an industry of deceit in the UK that uses sham marriages to circumvent immigration control. Marriage is a precious institution and should not be hijacked to make a mockery of the law or our immigration system" (Home Affairs Committee, 2014). Vaz (2014) uses the salience of "marriage" as a potent signifier in conveying the threat of being corrupted, overtaken and deemed impure. Wemyss (2018) argues as the threat of marriage migration is reinforced, by the Home Office, the practices to surveil and discipline couples increasingly rely on racialised and gendered stereotypes. Important for Wemyss (2018) is how the everyday citizens and institutions (registrars, churches, public citizens) are policing the genuineness of marriages, and further internalising border control. The two tropes in the discourse of sham marriage are one of the gendered notions of protection from forced marriages, the other, humiliation of couples.

Forced marriages, defined as one person in the relationship not consenting to the union, is a fortifying practice for the Home Office to legitimise increasing surveillance on couples. The Home Office defines forced marriages as "one in which one or both partners do not consent to the marriage but are coerced into it under duress, which can include physical, psychological, financial, sexual and emotional pressure" (Home Office, 2021b). Protection against forced marriage occurs through human rights law, as it is a form of domestic abuse. My critique of the Home Office's perception of sham marriages does not ignore the harms of forced marriages, nor do I argue there should not be safeguards to protect against domestic violence, rather I aim to clarify how the surveillance of marriages relies on discriminatory tropes. Chantler and authors

(2009) highlight the assumption, by the UK government, that "South Asian and Muslim" communities are most vulnerable in the practice of forced marriage. The concern in associating the practice of forced marriage with a diaspora of communities intersects with the trend of framing women as "victims" in need of saving, thus removing agency. Aradau (2004) identifies a similar trend in how identification of migrant women governs through either the "politics of pity or the politics of risk". By tracing how the surveillant practices of forced marriages, or issues of human trafficking, relies on cultural and gendered notions, it is possible to contextualise how the use of an algorithmic tool may replicate and reinforce similar tropes (Carver, 2016). Beyond the concern over forced marriages, and the tropes of creating victims of particularly women, the practice of surveilling sham marriages in the UK has worked to humiliate applicants.

An underlying practice of surveilling sham marriages is the use of humiliation, by border agents, of couples. Wemyss (2018) notes the public is brought into the "spectacle" of catching and shaming couples suspected of marrying for immigration purposes. In the performance of television host, of the television programme "Sham Marriage Crashers", "catching" the couple in the dramatic act of contesting the marriage during the wedding vows, the UK audience is displayed the narratives of who are the perpetrators of Sham Marriages and who are the victims. What is reiterated in this media performance is the construction of white European women (Wemyss et al., 2018) , who are EAA citizens, and have the right to reside in the UK (this was before the exit of the UK from EU regulations) selling their status to mainly South Asian men. As the two narratives of victim / saviour and threat/mockery construct the policing of Sham Marriages, the algorithm used to assess the risk of an application must be considered within these frameworks. As the discourse of Sham Marriage policing in the UK reveals, a gendered and racialised dynamics, a broader discussion, situates how technology, love and control are problematised.

5.3 Sham Marriage and Love as a Technology

Disciplining marriages of non-UK citizens transforms a legacy of love into a technology to mediate belonging. Notions of belonging in Britain are mediated through the invisibilisation of white normativeness. Wemyss (2018) proposes that belonging construction in the UK rests upon an "Invisible Empire". Notions of the "white liberal discourse"—that is, the institutions and social actors in Britain that actively produce a "knowledge/power" structure that obscures "past and present" relations of power (McClintock, 1995)—is legitimized. Wemyss (2018), along with

Yuval- Davis (2011), foster a conversation of how a sense of belonging, or the sense of feeling at "home", is enacted by "everyday practices" of construction of us versus them. Both authors insist upon a broader reading of power based on Foucault's (1995) idea of the diffusion of power through institutions, social norms and knowledge to discipline and control the population. Yuval-Davis pairs Foucault's theory of disciplinary power with Bourdieu's to denote that the "habitus" is embedded with a symbolic power structure, constantly interacting with the socially and structurally constructed subject. These two theoretical concepts of power are applied to undermine the construction of normativeness and the essence of being "British." Wemyss (2009) deconstructs "Britishness" through the notion of "common sense" as a Gramscian construction of hegemony, elite power, language, and the norms that are accepted as the rules of society. Earlier thinking on belonging, Britishness, and the fluidity of the norms of society grounded Wemyss and Yuval-Davis (2011) in their contemporary work around the Hostile Environment. Construction of Wemyss (2009) and Yuval-Davis (2011) state that the invisibilised structures dictate and discipline belonging in the UK and operate technologies to internalise the border.

The Hostile Environment policies are infused with these invisible power structures of belonging dictated by racialised hierarchies (Wemyss et al., 2018; Yuval-Davis et al., 2018). Everyday encounters with the dispersal of border control present in UK migration governance include checks at schools, health care, taxes, employers and landlords; these have become a "technology" of migration control (Griffiths & Yeo, 2021). Wemyss and colleagues (2018) extends this notion to constructing "sham marriages as a technology to manage diversity" (p.152). Encouraging a historical analysis, Wemyss (2009) offers the colonial legacies that construct the state's ideals of intimacy. Sham Marriages are built against the notion of "genuine", which, as argued in earlier work of Wemyss, is informed by the "white liberal discourse" that has constructed the marriage of British nationals to non-British nationals as a threat (Charsley & Benson, 2012) . The new acts of the historically situated notion of "genuine love" now fall on the border actors who become the new agents of "moral gatekeepers" (Wray, 2006). The dispersal of the border agents regulating love has extended to church registrars, ministers and border enforcement officers. What is uncodified is how one recognises true love.

Love, like belonging, is thought to be constrained to the emotional realm. D'Aoust (2013) urges that we need to read love as a political concept. D'Aoust (2018), similarly to Yuval- Davis (2018), draws from Foucault's (1995) theory of governmentality as a form of power through the

"conduct of conduct" to enact "complex forms of power" (D'Aoust, 2013). Extending the notion of governmentality, D'Aoust (2018) suggests that "love is a technology" as it is a structure of power present in a person. D'Aoust (2018) insists that the materiality of love is crucial and is a component of the production and reinforcement of invisibility mobility rights requirements (Scheel, 2017).

Wemyss (2018) similarly engages with the idea of love and materiality in the production of genuineness that couples need to produce to border agents. The infrastructure of migration governance relies on the input of stereotypical knowledge and "gut feelings of genuineness", as the notes taken by the border agents during the couple's interviews greatly inform the treatment of the case. Racialised notions of beauty infrastructurally inform the decision-making of border actors, who have been known to use the relative attractiveness of a couple to determine their state of love, demonstrating the materiality of love to be informed via "good looks" (Wemyss et al., 2018). From D'Aoust's (2018) understanding of love, a technology of control, there is a reinforcement of Wemyss (2009) and Yuval- Davis(2013), upholds the imagined idea of "Britishness" with white normativeness. Attempts by the Home Office to predict and verify love between two people works to produce historically informed boundaries of belonging as the very practice of love has become notified in white production.

The findings of Wemyss (2009) and D'Aoust (2018) share the sentiments that border agents reflected that one could determine the genuineness of a relationship from a "gut reaction" based on the couple's interaction. D'Aoust (2018) claims this is a feature of bio-power focusing on how bodies perform in a space with one another, and this is to say that the suspicion is based on non-objective data. This practice has notably been amplified for European citizens who have settlement status in the UK post-Brexit and wish to marry a non- UK citizen (Yong, 2023). Attempts to quantify true love are based on tactics of language abilities, body language and ease of the couple. Wemyss (2009) demonstrates the pattern of border control attempting to control interracial marriages by drawing from the colonial construction that cultural barriers obstruct a genuine love connection. By combining the notion of sham marriage as a technology to control diversity in the UK (Wemyss et al., 2018), and D'Aoust's (2018) view of love as a technology, it is possible to understand the context of the technical infrastructure of marriage regulation in migration governance. Contemporary practices of regulating and controlling marriages have turned to automated features to perpetuate past patterns of discriminatory notions. Expanding the

conception of marriage regulation as a technology of governmentality aimed at diversity contextualises an infrastructural approach. This can reveal the power relations in the automated risk assessments of marriage applications and how they reinforce, further invisibilise and perpetuate discriminatory outcomes. As the practice of regulating marriages between UK citizens and non-UK citizens has been historically contextualised, there now can be an examination of how the risk assessment algorithm is positioned to reinforce past notions of 'genuine' love.

5.4 Pitfalls of the Triage Model

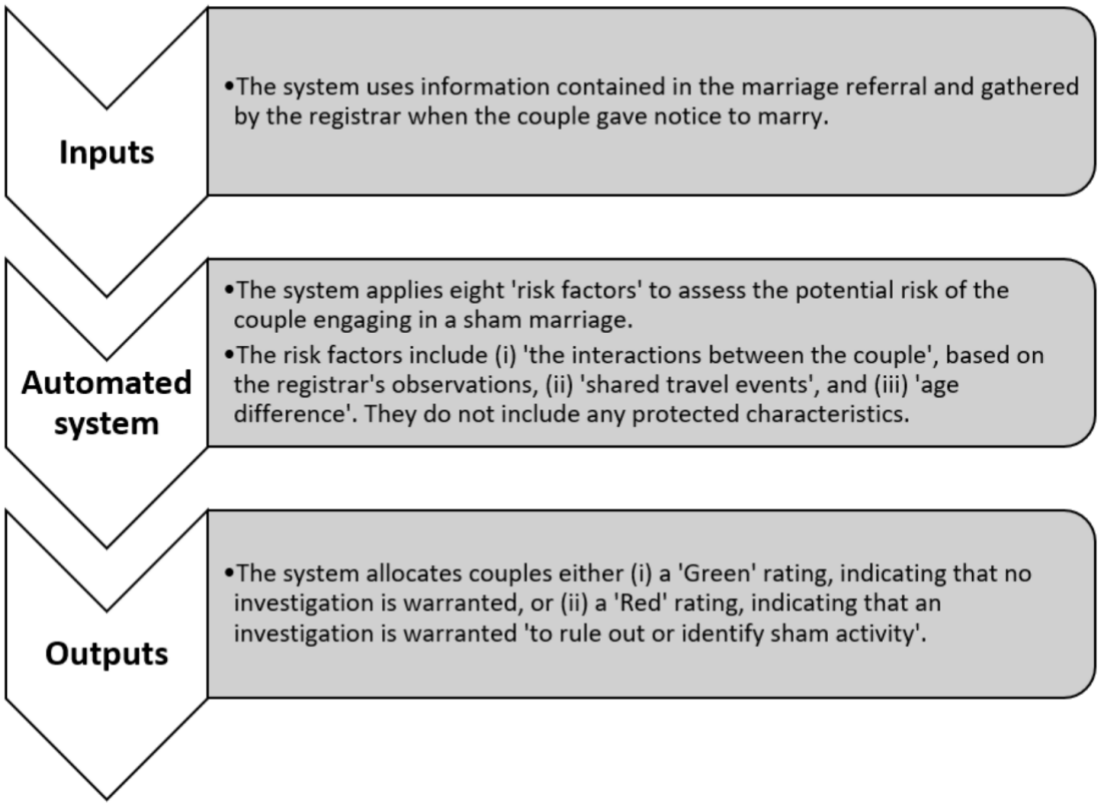
The Sham Marriage algorithm risk assesses marriages sent to the Marriage Referral Assessment Unit (MRAU) (Bolt, 2016). The MRAU is described as follows:

> MRAU are responsible for initial enquiries in relation to the scheme. Referrals from England and Wales are referred electronically from the registration officers through data feeds and include information provided by the couple when they gave notice and, if appropriate, a section 24 or 24A report setting out the registration officer's suspicions about the marriage. This information then enters a triage process, where it is assessed against risk factors to determine the potential risk of the couple engaging in a sham marriage (Home Office, 2021b).

MRAU was set up to inform the applicants if their marriage passed the triage system. Included in the description of MRAU is the implication of the "data feeds" and the "suspicions about the marriage" (Home Office, 2021). How and what are these data feeds? What is transformed through the "electronic" is a tangible material consequence of knowledge formations transmitted through ubiquitous data sharing. Travelling in these data flows is the solidification of metadata about the applicants, observations, "gut feelings," and worries about the performative truth of two people. Next, on the journey through the infrastructure, this data is transformed and repurposed through a triage system. In a ICIBI report (2016) the tool is described: "MRAU used its own triage model, known as the 'dial'. This brought together known intelligence, profiling agreed by Immigration Intelligence and section 24 reports in order to categorise couples as either 'red' (liable to be extended to 70 days for an investigation) or 'green' (could marry at 28 days). MRAU carried out further research on the red cases to add detail" (Bolt, 2016, p. 17). PLP (2023b) visualises the process of the Sham Marriage tool as follows:

Figure 9: Public Law Project's Outline of Sham Marriage Tool

The core elements of the Home Office's algorithm are set out below:



Similar to the technology discussed in the previous chapter, the Streaming Tool, the Sham Marriage Algorithm, is a risk rating system with a green or red output. The outcome of red dictates the applications that require more time, surveillance, and application materials that prove the validity of the couple. In the process, green applications are assigned a letter, permitting the couple to marry. Unlike the previous manual data entry, the Sham Marriage tool automatically registers the need for intervention and the amount of surveillance required at the time of processing; The algorithm draws from several data entry points, which help determine internal border practice in the treatment of specific applications.

Automation practices in policing sham marriages have existed "at least since 2015" (Maxwell & Tomlinson, 2022). The Home Office frames this tool as a means to deal with the changing Immigration Act 2014 requirement to share information regarding nationalities who have settled status in the UK and who wish to marry a non-UK citizen. This tool began as a RAG system (red - amber - green) ranking risk based on traffic colour lights. In an Assurance and Quality Assessment (AQA) carried out by a third party (unknown), the technical overview

stated, “the model has been designed using DACC systems to automate the processing and classification of data. The model itself is a Random Forest classifier, combining marriage notice information with historical data both on the individuals and the couple to triage data” (Home Office, 2019a). Auditors of the algorithms questioned if the “random forest classifier” was the suitable model for this type of algorithm (Home Office, 2019a). A random forest classifier is a collection of decision-making trees that have multiple inputs into a decision-making system (Alpaydin, 2021). Unlike the Streaming Tool, this tool does not use nationality as a direct input to determine risk. Even without using nationality as a direct input, there is a 25 per cent higher risk rating for “Bulgarian, Greek, Romanian, and Albanian” nationals by the algorithm (Public Law Project, 2021). This disproportionately high outcome of the Sham Marriage algorithm is accordant to research examining how automated technologies can use other factors to produce racialised results (Angwin et al., 2016; Benjamin, 2016).

The racialisation process went from direct discrimination, or race as an input as seen in the Streaming Tool algorithm, to an infrastructurally reinforced outcome. Simply put, the dispersed logic of the algorithm itself acts as a conduit for reinforcing historical patterns of discrimination. One of the recommendations from the AQA reviewer of this technology is articulated as “one of the most significant assumptions is the reliability of historical data (free from biases and systematic errors). This is used in the methodology to train/ learn the rules to predict new cases. Changes in data quality may become apparent over time, particularly if ‘live’ data creates biases” (Home Office, 2021e). The rating of the algorithm from a reviewer is “amber-green”, and the higher risk portion is the “risks about data quality changing over time. The data pipeline is robust, so default values will be used if unexpected data causes errors, but the potential impact on model performance is poorly understood” (Home Office, 2019a). The interaction between the reviewer and this algorithm mirrors this chapter’s concern about the feedback loop ratings of marriage risk becoming reinforced through data practices. As the inputs are vast or, as the auditor of the Sham Marriage system said, the “data pipeline is robust "(Home Office, 2021e), there will be a continuation of discriminatory results.

The AQA Report presented “the model’s use as envisioned at the project’s inception” but there are “some inconsistencies between what is described in the report and how the model has been implemented in practice” (Home Office, 2019a). PLP notes:

> the details of the human review stage are unclear. We do not know whether the human decision-maker exercises meaningful discretion. Especially if the human decision-maker knows that a case has failed triage, there is a risk of automation bias ... We have been told that cases that fail triage are "usually" investigated by the Home Office, but we do not have precise figures (Public Law Project, 2021).

PLP's statement about the features of automation bias is reflected in this chapter's critique of the Sham Marriage algorithm; the political implications of the case workers' making decisions and accepting the risk assessments of an automated tool. Infrastructurally, the Home Office has begun to prioritise digital tools in their decision-making processes, perpetuating a discriminatory feedback loop. As discussed in Chapter Two, feedback loops operate in a self-fulfilling manner (Lum & Isaac, 2016; O'Neil, 2016); and as the technical infrastructure of the Home Office becomes increasingly more connected, the networked nature of logics from other programmes becomes more embedded.

The connection between digital programs can be seen in the centralisation of the DSA in the creation of the current data-driven projects, as well as the proliferation of similar tools like RAG rating systems. In the Sham Marriage Tool context, a system draws from various data points to determine the perception of a marriage's risk. Caseworkers generally accept this rating to investigate the application. This model of accepting a rating exemplifies how the Home Office has created an infrastructural imperative for their workers to accept technologically mediated decisions. At stake with this tool is an algorithm changing the particular experience of both citizens and non-citizens with border practices. The logics of the Sham Marriage tool amplify the past patterns of discriminatory features of marriage migration practices by drawing from the past articulation of risk.

5.4.1 Discussion: Known features of Sham Marriage Algorithm

During an interview, Kazim (2022) commented, "we are calling it the sham marriages algorithm, which is essentially a tool that rates couples who want to get married against many risk factors. We know there are eight risk factors, three of which we have identified through making FOI requests, three of whom we know, and five of whom we do not know. We also know that some nationalities are flagged for investigation at a higher rate than other nationalities." Kazim (2022) flags the threat of automation bias. This model of algorithm brings up questions about the inputs used to create the initial risk rating. There are eight inputs, three

are known shared travel events, age differences, and interactions as observed by the registrar (Maxwell & Tomlinson, 2022). Repeatedly, the Home Office has assured that nationality is not an input into the triage model. What is known is that the outcomes have disproportionately affected communities in "West London" at 28.8%. 'Compliant – non-sham' possibly indicates the need to adjust the sensitivity of the 'dial' (Bolt, 2016) and flag the nationalities of "Bulgarian, Greek, Romanian, and Albanian" (Kazim, 2021). Outcomes having a racialised and disproportionate impact must be seen (Benjamin, 2020) for it is not the intentions of technologies that matter but the outcomes and conditions they produce. A ICIBI report (2016) recommends that the Home Office "seek Ministerial authority to add certain nationalities" to the triage process. In response to the 2016 report, the Home Office stated, "the scheme has now been in operation for 18 months, so we now have sufficient data to conduct meaningful analysis. The analysis has already commenced, and we aim to report on the types of cases and nationality groups that abuse the marriage route most frequently by late January/early February 2017. Following these results, ministerial agreement for profiling certain nationalities will be sought if required, without delay" (Home Office, 2016). As of April 2022, there was confirmation from the Home Office that it does not use nationality as a criterion. The possibility of adding nationality as a direct input demonstrates that the inputs into algorithmic tools are fluid and can be manipulated by the current negotiations of the border agents. The Home Office's wish to use the data collected via the Sham Marriage algorithm treats the outcomes of the technology as not influencing the decisions of cases. Disregarding the role of technology in forming specific outcomes will situate the algorithm to perpetuate a feedback loop, which will justify increased surveillance of certain nationals.

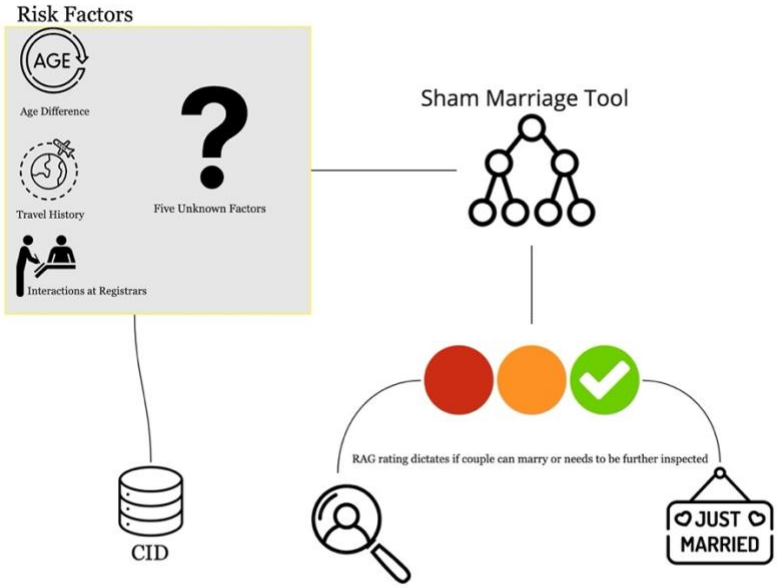
After discussing the available features of the Sham Marriage tool, there will be a fuller image of what happens after using this technology. Below is a image of a black box to represent the infrastructural concealment and the socio-technical notion of a black box of technology (Pasquale, 2016).

Figure 10: Black Box of Sham Marriage Data Inputs

The triage process uses the following eight criteria:

In light of the black box around all of the factors, I work to investigate the known inputs into the Sham Marriage Algorithm. Below is a map of the known features of the Sham Marriage algorithm:

Figure 11: Systems Map of Sham Marriage Tool



5.4.1.1 Travel History:

The triage tool uses the partners' travel history to risk-assess the marriage match. D'Aoust (2013) describes this tactic as utilising "data doubles" or the electronically recorded shadows of past travel to infer the intentions of a spouse. As an example, D'Aoust (2013) recalls an:

> immigration officer interviewed in Kiev explained to me that after examination, he noticed that a Ukrainian woman sponsored by an American citizen had once left the country to go to Turkey. This could only mean, he said, that she was involved in the global sex trade and earned her living as a prostitute there, as few Ukrainian women could afford to leave the country. He decided to share his concerns with the prospective husband, telling him he doubted the woman was really in it for love (p. 265)

Social assumptions based on nationality, and specific genders, the ability to afford holidays is seemingly embedded into the informal requirements (De Genova, 2017) for the Home Office to evaluate the genuineness of relationships. Leslie (personal communication, 21 March 2023) reveals that "in terms of age, and shared travel arrangements, like we (PLP) do not see how that correlates to nationality, because it's not, it's not the same. The nationalities that are flagged are known for having a bigger age gap in relationships," yet as the discussion continues, Leslie (2023) notes how there is an association of certain countries with the sex trade. D'Aoust (2013) captures what Leslie (2023) later connects to: how the associations or bias with certain countries for illegalised practices can then subject nationals of those states to increased surveillance. To include shared travel history rather than just the non-UK nationals' recent travel history. Similar to the gendered notions of acceptable age gaps, in the stereotype of a white British man with a young bride being encoded, the inclusion of shared travel history intersects with how *indirect* considerations of class, gender and nationality could be included in risk productions. The Home Office's inclusion of shared travel history reiterates underlying assumptions that reinforce the trope of genuine versus non-genuine marriages.

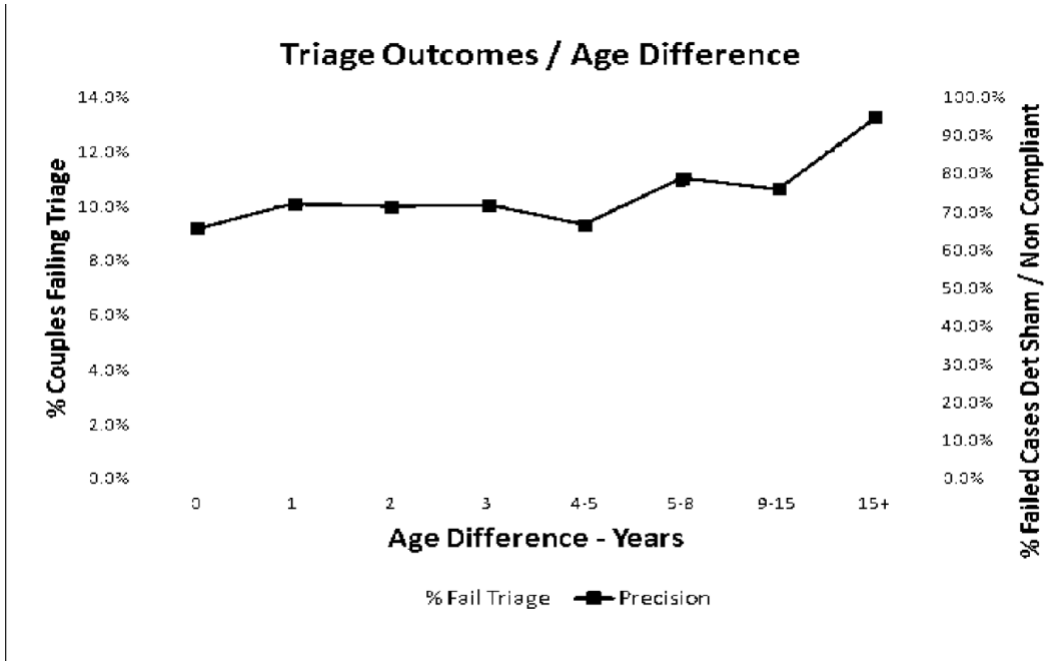
The Home Office (2013a) claims "another important feature is shared travel events, whereby if a couple have travelled on many flights together, there is a suggestion of a stronger relationship between the parties" (p.7). Holidays spent together as a couple as a factor of genuineness reiterates the construction of a particular love match. For some communities, travelling together before marriage may not be culturally permitted. The ability to travel together rests not only on cultural protocols, but the context of the visa regime. If one partner requires a

visa or has an insecure status in the UK, the couple's ability to travel is limited. As an input into the algorithmic system, travel history introduces how the data used to produce risk assessment is steeped in historical constructions of genuine love. This input is a reminder that the digital border tools do not operate within a vacuum, but are a continuation of a series of socio-political technologies. Another data input for the Sham Marriage tool is the age difference of the applicants.

5.4.1.2 Age Difference:

The Equality Impact Assessment report on the triage system produced by the Home Office resulted in "no direct discrimination based on age"(Home Office, 2021e). Under the 2010 Equality Act, "age" is a protected characteristic that cannot be discriminated against. Using a graph of undefined ratios and scales, the Home Office reports that there may be "indirect" discrimination based on age "as couples with a greater age gap will fail the triage process… this is justified as data shows sham marriages are often between individuals who have an age gap of five years or more"(Home Office, 2020a). The justification for a certain level of age-based discrimination is using "several other non-protected characteristics" in the triage process (Home Office, 2020a). Below is a graph demonstrating the stark increase in the age gap and failure to pass the triage system.

Figure 12: Triage Outcomes for Sham Marriage Tool



(Home Office, 2020a)

The known use of a characteristic which skews the results of the system points to an embedded feature to reinforce the past findings of data on sham marriage investigations.

The infamous 1970s "virginity testing" (Marmo & Smith, 2010) offers a starting place to hypothesise historical gendered practices that may be codified into the triage system. Operating in the infrastructural sentiments of the Home Office are links between "sham marriages" the age difference, which is informed by various stereotypical and discriminatory past behaviours. Virginity testing refers to the "vaginal exam conducted on a woman" after arriving at Heathrow airport in 1974, as the immigration officer did not believe, due to her older age, that she was a genuine bride (Marmo & Smith, 2010). These suspicions were based on the claim of the officers that unmarried women in the "subcontinent" are virgins and that a genuine bride of a man from the subcontinent should maintain this sexual purity (Smith & Marmo, 2011). While virginity testing offers a cruel example of invasion of body privacy in legitimising mobility rights, it points to the historical linkage between age, sexuality and genuineness still performed today. In at least 34 cases, the Home Office performed this type of examination of women, offshore, and so within the visa centres of various countries. The case study of "virginity testing" demonstrates two features of historical patterns: (1) the duality of the figure of the woman, specifically the South Asian woman, as both victim and deviant; (2) the black boxing of knowledge constructs built on biased data that informs the material treatment of migrants.

Women's agency and classification fluctuate in the space between a victim of sex trafficking, and thus vulnerable subjecthood, and the perpetrator of non-genuineness. Control over sexual behaviour, in the case of Virginity Testing confirming they had not partaken in such behaviour, links to the larger governmental disciplining technology. Turner (2014) reads the historical lineage of the figure of the migrant woman as being a threat to the "purity" of Britishness and suggests that while the absolute power of migration may be "subtle," the logic is colonially derived. Wray (2006) and Carver (2016), state that the laws regulating marriage have historically been informed by the masculine image of "Britishness" and the feminised threat of the migrant bringing along the increasingly feminine depiction of the welfare state. Carver (2016) suggests further that the hierarchy of citizens forms the patriarchal British Nation, with the moral duty and right not to allow women to marry within the UK, as they will be culturally isolated. Wray (2006) says that the hierarchy of accepted marriages is constructed on the British

nation's current cultural and social values; thus, observing the constructed “unwanted” is a deeply revealed category of the desired. In the framework of using an automated decision-making tool embedded in hierarchising the features of the desired and the undesired, age difference presents a continuation of the beauty and love standards placed within love matches in the UK. The age category is not neutral but is presented and upheld by the Home Office due to historical data of past sham marriages. Knowledge structures embedded into technological structures carry with them the historical practices of violating bodily privacy due to suspicious age. Concurrently with the archetype of the undesirable “migrant woman”, Scheel and Gutekunst (2019) found disgust and distaste from the bureaucrats when they were given a case with an older woman marrying a younger man. The moment a woman applicant is transformed from “genuine” or trustworthy to terrible offers a crystallisation of her worth. She is understood through a particular gaze. This experience is informed by an automated tool that correlates the same age considerations with a sham. All these practices are codified into the decision-making infrastructure.

Legitimacy for the Home Office decision makers to carry on being informed with the discriminatory practice of a data entry of age to a larger practice of justifying an intensified gaze based on gender roles. Intermediating in this space is the role and agency of an automated system that intensifies the practice of making gender relevant at the border. Yuval-Davis (2011) insists on adopting an intersectional approach to consider how the class, race and gender status of migrants position their interaction with the border. The particular arrangement of control between women, the state and the border are crystalised in marriage migration articulations, as “marriage is a social contract and a contract with the state” (Yuval-Davis, 2011). Thus, the mediator of this marriage's authenticity becomes a “moral gatekeeper” (Wray, 2006). An automated system as a component of categorisation between vulnerability/trustworthiness positions creates a new “moral gatekeeper” algorithm. Questions of the genuineness of love have been seen as policing intimacy. The Home Office outsourcing the moral gatekeeping to a technological agent introduces a self-fulfilling feedback loop: the tools are built with the bias/historical repression of women’s agency and thus reinforce the tropes of the migrant woman for the case workers (Kraft-Buchman, 2021).

5.4.1.3 Interactions of Couples at the Registrar

The Sham Marriage Algorithm uses the notes from registrars as one of the triage factors. Input of such criteria is a blatant example of a non-neutral form of data. Wemyss (2018) and D'Aoust (2013) assert that the interviews are a sphere of intimacy enforcement on relationships under the guise of assuring racialised purity in the UK. A couple's interactions are not an objective gaze of truth but are informed by cultural and social beliefs on the genuineness of love. It is unknown how a triage system uses these interactions. Is this a language-processing component or a scale-based input? A couple's interactions before a "registrar" mean interaction with an individual who can authorise marriage in the UK. This may be a religious official or with the civil registry office.

When asked in a FOI request about using register offices to report suspected Sham Marriages, the Home Office refused to provide the training material given to officers (Home Office, 2019). The Home Office (2019) report that:

> There may be other factors that arouse an officer's suspicions that are not listed, for example, the registration officer suspects that false documents or documents that do not belong to the person have been presented as evidence. But it is generally expected that it will be a combination of factors, together with the officer's observations of the couple's behaviour, which indicate that the marriage may be a sham (p.1).

Such a response leads to a technical invisibility of how the internalisation of the border impacts both citizens and non-citizens. For the last decade, it has been a practice among registrars to share information with the Home Office. In a Parliament Committee Meeting (2014) a registrar reports the practice of flagging individuals in a way that relies on ubiquitous factors:

> No common language is another common one. Those are the most obvious ones on their own. I think there is also a gut instinct. When you see a lot of couples arranging marriages you get a feeling for what a genuine response is, what are perhaps natural nerves and what perhaps might indicate something more than that. But we are talking about suspicions and it is not scientific (Home Affairs Committee, 2014).

In the same session a registrar reports that as you remain in the position, you become "suspicious" which reflects the same "gut feeling" (Home Affairs Committee, 2014). Baked into the registrars' reports is the continuation of the collection of data on the genuineness of love, which relies on prescriptions of love. Both registrars reveal that members of the public write in (via email) to the office about individuals who are registered to marry (Home Affairs Committee, 2014). What is unclear is the extent this publicly derived data is fed into the Sham Marriage tool,

however, there is a reiteration of the border control being spread and dispersed to everyday citizens. Transformed through this algorithm is input into an opaque triage system that creates a level of efficiency in embedding surveillance from beyond the border officers and infrastructurally combines this data with other political sites. Internalisation of the border is transformed in this context from being unbounded spatially, away from the physical border to other sites of power, like the registrar's office, and combined with multiple unknown features of automation. This tool mediates the genuineness of love, and it connects the border's dispersal to the border's political power to dictate worthy intimacy.

Scheel and Gutekunst (2019) argue that the policy of migration management is separate from the on-the-street bureaucratic practices that work to reinforce "informal hierarchies of desirability" (p. 858). The hierarchies discussed by Scheel and Gutekunst (2019) offer an intersecting line of "class, race, gender" that emerges from the encounters with the bureaucrats. D'Aoust's (2013) claims love is a "main political site which enacts power" and thus can be considered technology. Love is transformed first by the sovereign's desire to control, discipline and regulate genuine love via border laws and then through an automated system. By outsourcing the means of regulating love to registrars, the Home Office expands its disciplinary power to other public institutions, maintaining its Hostile Environment policy of distributing immigration control—with an entangled digital feature. D'Aoust (2014) articulates that acts of love are "micro sites of power for the individual and macro sites of power for the state" (p.326), transforming regulation of sexuality and genuineness into something that can be measured. The logic of the ambiguous automated tool interlocks with historical categorical power. Feminist critical data scholars (D'Ignazio & Klein, 2020; Wachter-Boettcher, 2018) , the legacy of technology producers devaluing emotion in favour of logic. In the process, human experience is flattened into the line of code, or in the case of the sham marriage, a node of a decision tree. The automation of genuineness of emotion has material consequence on the life chances of migrants.

Gender and the archetype of a vulnerable woman emerges in a story presented to the UK Committee of Home Affairs. One of the registrars uses a personal story that clearly constructs the figure of a "vulnerable European woman" being taken advantage of by a non-European man:

> One of the cases I was involved in involved a young Polish girl and it was a Pakistani man that she was supposed to be marrying. She was very vulnerable. She was here on her own. She had no parents back in Poland and I think she was perhaps picked on (Home Affairs Committee, 2014, p. 20)

Present in the registrar's account is the reiteration of the construction of a "vulnerable" woman that Scheel and Gutekunst (2019) theorise in the EU context. The presence of the archetype of the vulnerable young woman evidences the social influence of the registrar's notes which are then inputted into the Sham Marriage algorithm. By considering the records, notes and details of the registrar's observations, a technological embeddedness of the gendered encounter is inserted into the Sham Marriage algorithm. This is something that Scheel and Gutekunst (2019) theoretically problematise.

How day-to-day bureaucrats[9] conceive migrants is then codified and legitimated through algorithmic processing and results in a marriage application receiving more attention. Use of the reflections of the registrars is not a neutral data source but embeds socio-political archetypes into how marriage applications are being risk accessed. Inclusion from spaces that are beyond the border, marriage registrations offices or religious actors, into the Sham Marriage algorithm demonstrates the technical embodiment of a dispersed border space. By exploring the social relations that are inputted into the Sham Marriage triage system we can see that even without the *direct* input of protected characteristics, the algorithm is positioned to reproduce historically dictated conceptions of legitimacy.

Data drawn from a non-immigration enforcement area overtly embodies the dispersal feature of the Hostile Environment as it spreads the reach of responsibilities to agents outside the Home Office. There has been an emphasis on trying to "turn up the dial" of the local approach to investigating sham marriages (Bolt, 2016, p. 16). The relationship between immigration and the local registrars must be maintained (Bolt, 2016). The data-sharing practices and the data integration in an automated tool demonstrate the socio technical complexity of intimacy control in Hostile Environment policy. The function of this particular tool is to determine the time needed for the Home Office to investigate. To see the infrastructural compromises of the sham

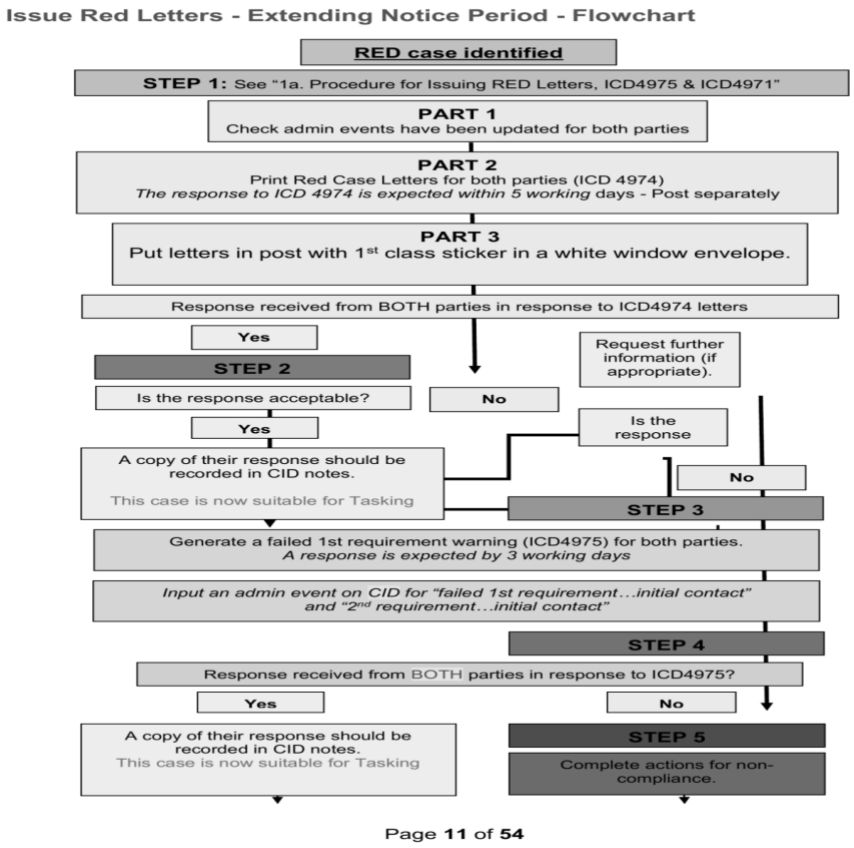
[9] Registrars are components of the bureaucracy of the Home Office as the offices of marriage registrations are entangled with the procedures of surveillance applications.

marriage algorithm, there needs to be an examination of the outcomes and the increased surveillance.

5.4 After the Tool: Time, Data and Interviews

The technical elements of the Sham Marriage algorithm have been explored, both via discourse and the framework of the tool; the outcomes of this tool intersect with a larger infrastructure of the decision-making process. Automation of the referral system fulfils the Home Office's new policy, introducing an extended time for investigating sham marriages. Before 2014, the period the Home Office could request applicants to investigate the relationship was 28 days. There is now a 70-day period the Home Office can halt a forthcoming marriage. This is dictated by the outcome of the Sham Marriage algorithm. Tracing the flow of infrastructure of Sham Marriage Tool can be seen below; it entangles citizens and non- citizens in the process of surveillance applications.

Figure 13: Flow Chart of Home Office Standards After the Sham Marriage Tool



(Home Office, 2021)

The diagram presents the Home Office workers' steps to insert the temporal block on couples. The flow chart demonstrates a disciplining of individuals who do not respond in a specific timeframe. The Sham Marriage algorithm's outcome triggers a flow of procedure, but the second stop on the feedback loop is the integration of time barriers for couples wishing to marry. This flowchart reiterates that the Sham Marriage algorithm invites surveillance of non-UK citizens and citizens alike. Both parties must respond. The known risk factors include shared data: not the individual age of the non-citizen, but the difference between the partners ages; where the couple has travelled **together**; and the interactions between the **couple** at the registrar's office and how they both perform love. I labour this point to illuminate that algorithmic systems that are directed at maintaining the internal border, those who are here as citizens and wish to marry a non-citizen, introduce a new layer of power dynamics. As the practice of visa by marriage has been historically racialised and gendered, the Sham Marriage tool introduces an additional obscured rating of risk to the surveillance process.

As the Sham Marriage outcomes red risk assess applicants with a nationality of "Indian couples were flagged for investigation for entering into a potential sham marriage around 10% of the time and Pakistani nationals around 15% of the time. Bulgarian and Greek couples were flagged for investigation at a rate of between 20% and 25% despite making up a much lower proportion of the proposed marriages between a UK and non-UK national" (Public Law Project, 2023). I reiterate how the high percentage of Bulgarian and Greek applicants being risk assessed demonstrates the fluidity of racialisation, as EAA citizens living in the UK have historically faced racial discrimination (Hickman et al., 2005) As Hickman and colleagues (2005) note there are "shades of whiteness" that contribute to the hierarchisation of migrants primarily from Eastern Europe. Racialisation of European migrants intersects with other notions of "Britishness" primarily though class relations (Botterill & Burrell, 2019). As Botterill and Burrell (2019) note, migration rule changes following Brexit exacerbate the "in-betweeness" for European migrants; they are excluded from the labour market, and socially othered, whilst being racially privileged through their whiteness. Feelings of in-betweeness, included/excluded, belonging/othered, may have historically been present for European communities in the UK. What is new is the digital technologies involved in the categorical power.

Aradau's (2015) reflections on their process of receiving British Citizenship via the naturalisation route explores how the practices of data collection, testing (or interviews) and surveillance must be placed in a longer epistemic conversation. Here, I draw on Aradau's (2015) claim that:

> datafication does not simply quantify people and things by decoupling data from their physical presence and enabling liquid infrastructural circuits that allow for the quick manipulation and circulation of data. It makes possible the enrolment of citizens and non-citizens into renewed processes of accumulation, where data has become both a commodity and an asset (p. 6).

By contextualising the datafication of both non-UK citizens and citizens through the logic of "liquid infrastructural circuits" (Aradau, 2015, p. 7), there is a clarification of how the application of the automated tool of the Sham Marriage tool introduces a layer of technological ambiguity in the shape and the power of the border. In the space of love, marriage and connection, the border emerges. Love has been defined in this chapter as an ambiguous and purely political device (D'Aoust, 2013; Wemyss et al., 2018). The use a technically opaque algorithm to produce risk assessments of love matches raises questions as to how individuals are treated.

The concept of the Möbius ribbon (Bigo, 2001) is useful to contextualise the blurring of internal and external persons. A UK citizen may not expect an encounter with border as categorising them as a risky subject. They nevertheless move along the ribbon in an obscured manner of being seen as risky. Non-UK migrant border surveillance may be expected, but their placement in the "liquid infrastructural conduits" of datafication is unknown. I foreground the incompatibility to an obscured algorithm, producing a rating of risk, with the equally slippery concept of genuine love. How would we define who is genuinely in love? Is it the couple who has travelled around the world, is it the older white man with a young woman or is it a couple who, whilst filling out documents at the registrar, perform being in love appropriately? Crucially the practice of determining genuine love through a technological device introduces the threat of confirmation bias, the over-reliance on the outcome of the algorithm by Home Office workers.

As discussed in the previous chapter, there is a danger of the self-fulfilling prophecies that technologies carry through an association with neutrality and the trust human actors associate with technology. This is not to say technology is perceived as neutral, but the infrastructure of the Home Office forces decisions to be embedded with technological

components. Kazim (2022) commented on her research into confirmation bias that there may be a counterintuitive training approach to breaking confirmation bias; that as individuals learn more about the black box of technology, they report higher levels of trust in the machine. The Sham Marriage algorithm offers twofold the pitfalls of confirmation bias, in the nationalities of those suspected of committing a fraudulent marriage and the risk rating given to them in the dial. The Sham Marriage algorithm offers an automation of the Home Office that will further investigate couples. Thus, the tool triggers a feedback loop of gaining more data on couples of certain nationalities (Home Office, 2013a). From this performativity of data, the caseworkers "are trained to scrutinise applications and consider all the available evidence, including that collected through interviews, before making a decision. Applicants and their sponsor may be invited for an interview to address any concerns the caseworker may have as to the genuineness of the relationship, as well as to investigate the details of the application" (Home Office, 2013a). There is a lack of transparent data on how often a failed triage application is overturned by a caseworker and not asked to submit more information. The automation of determining the couples to be surveilled further opens a new vacuum of accountability operating at the border. The current legal case is being brought forward trying to bring transparency to the exact relationship between the Sham Marriage algorithm and decision-making within the Home Office.

5.5 Conclusion

So what? What is new? There are traces of using discriminatory technologies derived from stereotypical tropes of belonging in the past. What is at stake with using the new algorithm to dictate couples' risk? Five unknown factors play a role in perpetuating more surveillance of particular couples. The second known criterion of risk age differences has been linked to how race and gender intersect. The practice by caseworkers to use beauty standards and sexualising behaviour to distrust women marrying younger men is carried through by including the age difference criteria in the algorithm. Finally, the last known criteria of interaction with the registrars perpetuate the internalisation of the border to other public spaces. Churches, ministers, and officials now have their reflections inputted into an algorithm.

By dissecting the tool's criteria offers technical infrastructural analysis, from questioning the tool's outcomes to the final examination of what the Sham Marriage means for the *Digital* Hostile Environment. The outcomes of the tool disproportionately risk assessing "Bulgarian, Greek, Romanian, and Albanian nationality are given a red light at a rate of between 20% and

25% − higher than the rate for any other nationality" (Public Law Project, 2021). This tool demonstrates how algorithms can use a range of data inputs to construct a feedback loop within the infrastructure of the Home Office to justify unequal surveillance of certain bodies. The Sham Marriage tool is located within the internal features of the border, and becomes a new power dynamic facilitating couples, case workers and an algorithm constructed truth on intimacy and love.

The placement of this algorithm in verifying love offers a powerful political tool to discipline and undermine certain practices of love. D'Aoust (2013) and Wyness (2018) suggest that love is central to political life. Love interacting with the state duplicates the relationship of belonging and othering and thus becomes a technology of the state to cast out certain relations. Placing a tool in emotional embodiment transforms the political space into a binary rating, an automated practice of calling individuals into the Home Office for further inspection. At stake with this technology is the invisibilisation and reinforcement of the *Digital* Hostile Environment.

Pushing past decisions into the present offers what is at stake with this tool, a dispersed network of technologies whose logic is unknown both to decision-makers and migrants as well. Technologies for discipling marriage migration is not new. What is transformed is the efficiency and the process the Home Office uses to dictate couples that are more likely to be entering fraudulent marriages. The infrastructural process of the Home Office legitimise the Sham Marriage tool. In the coming months, the legal action against the Home Office for the use of this tool should reveal more information about the algorithm. The previous two chapters have explored the discriminatory results of algorithms within the *Digital* Hostile Environment. I now move to explore how we can apply the established problematisations, patterns and features of border technologies to unearth the new case working system of the Home Office, Atlas.

Chapter Six Atlas: Experimenting with Infrastructure

My first interaction with Atlas was inconspicuous. As a regularised migrant in the UK, I am familiar with the visa regime and faced the bureaucratic process of applying for a visa. Due to the Covid-19 social distancing rules, my third and final Tier 4 Visa was filed from my Southeast London flat. This encounter with visa processing involved a facial recognition app, an online form and then, finally, an email providing the good news my application was accepted. This email was my first introduction to a database that would feature heavily in my upcoming research, for it was sent to me under the username "Home Office Atlas". When I received the email, I thought nothing of Atlas. After researching the new case working system of the UK, I am now wary of how data is being processed, hierarchised and presented to the Home Office mediated by Atlas. My investigation into Atlas builds on the previous chapter's discussion on algorithmic processes, but directs attention to how data errors, internalised data sharing and embedded automation is being enabled by the new case working system- Atlas. As we build on the attention of algorithms to databases, important for the discussion is the theoretical positioning of how the production organising the knowledge of populations is poised to transform governance practices.

This chapter will first ground the debate on databases within the migration context. From this grounding, there will be a focus on the legacy system, Case Information Database (CID), and demonstrate the challenges of redesigning a case working system. Databases offer not a departure from the technology of the archive but a transformation of how the power produced by the archive can be subjected to individuals. Database discussions are not new to migration literature and have been widely discussed in the European context (Broeders, 2007; Glouftsios, 2019; Metcalfe, 2022; Ruppert, 2012). Databases "enable detailed data to be stored, accessed and connected; they also create silences through the absence of data or constraining what questions can be answered"(Kitchin, 2021). From the overview of the change from CID to Atlas, I will build on the previous two chapters' critique of automation. Automation within the Atlas system offers two main contentions the possibility of reinforcing the known discriminatory features of machine learning and the lack of transparency of these automation features. From a consideration of the embedded features of the automation present in Atlas, I then move to explore how, in practice, the caseworking technology is producing data errors. This chapter differs from the

previous two as the project of Atlas is ongoing and not fully formed, there are yet to be codified outcomes of discrimination. Tangentially, Atlas is not an automated decision-making algorithm – it is rather a database with layers and networks of technically opaque automated platforms. Atlas offers a case study on how technology is becoming the "back bone" of the UK border system (Thylstrup, 2019). Caseworking systems like Atlas are the portal that Home Office workers use to manage, trace and produce knowledge to govern mobility in the UK. The aim with this chapter is to make visible the infrastructure of Atlas and to substantiate my hypothesis that the ethos of the *Digital* Hostile Environment can be seen in the patchy, dysfunctional and heavily automated features of the case working system. The ethos of the Hostile Environment is defined in the Chapter One as embodying the antagonism dispersed through border policies. This final case study of a socio-technical tool aims to question how the future of bordering technology is poised to create gaps and silences in specific populations. The limitation of this research is that unlike the Streaming and Sham Marriage Tool, there are no documented racialized/gendered outcomes, decisions or existing legal actions against Atlas. Only through an infrastructural approach can we see the emerging consequences of the new centralised, automated database maintaining migration governance.

There have now been reports that the Atlas system has 76,000 mis-recorded, or data errors, that have "ruined people's lives" (Dyer et al., 2024). There is no clarity on the impact of the data errors, or if protected characteristics, race and gender, are a factor in the errors.[10] I chose to research this tool as the pattern of opaque data sharing and automation is similar in nature to the previous case studies. I hypothesise embedded in the infrastructure of the *Digital* Hostile Environment there is increasing technical and social opaqueness on how individuals are politically categorised and processed.

6.1 Databases and Migration Governance:

The intersection of databases and migration governance are not novel, I argue that attention to how the Home Office has implemented a new case working system flags how future bordering practices are poised to categorise, hierarchise and filter individuals in a biased manner.

[10] When I started researching Atlas in 2021 to the time of writing there was no known "outcomes" or impact on migrant's life. Most of my research questions were aimed at using Atlas as a case study to show the pattern of the Home Office developing technology that is not fit for purpose. Two months before submission there were reports of data errors and wider malpractice. I have now incorporated some of the findings into this chapter. Due to the fast-changing nature of technology some of the findings may be "dated" at the time of reading.

Grounding this chapter on how migration literature has grappled with border practices and databases will position how Atlas is read as an agent in dictating trust within migration governance. The impact of databases on migration governance has been a topical subject since the 9/11 attacks on the USA. From that event, border scholars have long argued that the focus on security and migration turned into focusing on prediction and risk analysis (Amoore, 2009; Bigo & Guild, 2005b). From the proliferation of digitally enforcing the territorial border, a more extensive consideration for the hierarchies of travellers grew to the practice of "profiling" passengers(Amoore, 2013; Leese, 2014).

Another impact of database noted in migration literature (Amoore, 2006; Epstein, 2007) is the influence the collection of biometric data has on producing a new 'site' of truth. As fingerprinting and facial recognition are relied upon to verify a person at the border the databases that store the biometric data play a crucial role in the truth of an identity of a passenger. To illustrate the new site of the truth mediated by biometric databases think of a passenger entering the UK whose biometric data, does not match what the database contains. Truth on the identity of passengers, migrants and populations is now hosted in databases rather than with the individual. A more in-depth decision between truth and biometric databases can be found in Chapter Two. Glouftsios and Scheel (2021) argue that "we should avoid accepting uncritically the 'objective truth' that data practices purportedly reveal about individual subjects. Such practices neither *reveal* nor objectively *represent* the truth of travellers and migrants – their identities, intentions, trajectories and so on. Instead, they perform the very ontologies and identities of the people that they target" (p.133). Connection between how migration governance values data as objective source of truth for an individual demonstrates how databases, and information communication technology, function at the border. Features of filtering, ranking and categorical power have all been covered when considering databases, especially in the EU context(De Genova, 2017).

Migration literature navigating the power dynamics of databases has focused on the interaction with databases and upholding the Schengen Area. As introduced in Chapter Two, the EU member states entered an agreement in 1995 creating "free" movement between the internal borders for European citizens and a joint effort to secure external borders. The Schengen Area shows how borders operate in a porous manner to keep individuals out and allow specific populations to move efficiently. A core policy shaping the design and use of databases in the EU

is the Dublin Convention (Picozza, 2017) , the agreement between member states that the first country a migrant is identified, via fingerprints, is the only country the individual can claim asylum. De Genova (2010) states the Dublin regulation introduces multilateral actors and agreements to negotiate deportability of migrants in the European Space. To navigate this policy of bordering, the EU created the database, Eurodac, to record and manage the regularised versus illegalised migrants. Scholars have explored various aspects of the use of a database to filter (Glouftsios & Scheel, 2021), make illegal (van der Ploeg, 1999) and control mobility choices(Bauböck, 2018). Another crucial database in the EU context is the Schengen Information System (SIS). Bellanova and Glouftsios (2022) describes the SIS as the database consulted by "national authorities, such as border guards, police, migration offices and visa-issuing administrations, as well as European Union (EU) agencies like Europol, Frontex and Eurojust to control the flow of goods and people" (p.160) within the EU.

I build off the argument by Leese and colleagues (2022) that consideration for data must move beyond how data is used to control migration to integrating the "infrastructural politics of digital borders (p.162). Production of data knowledge on travellers is used to rank and filter mobility, but there needs to be attention to what occurs when the technology relied on to manage information breaks. Bellanova and Glouftsios (2022) critique the fragility of the database systems through the malfunctions, "bad data quality and failures to connect to other data systems" debunks the technological fallacy of "frictionless travel" (165) as the backend systems can cause technological glitches. For Lisle(2018) failure of automated technology is being baked into the "*pre-emptive* design" of border technologies. From the combined notion of "data fragility" (Bellanova & Glouftsios, 2022) and how the anticipated failure of technological systems (Lisle, 2018) shapes the practices, the standards and infrastructure of migration governance frames my critique of Atlas. By exploring the errors, recorded failures and patchy function of the Atlas we can consider how administrative technologies can contribute to the continuation of the *Digital* Hostile Environment. The exploration of Atlas builds on the past chapter's findings on the power of automation at the border.

This critical migration literature negotiates between the space of policy made possible through technological developments and how the technical components of systems like databases contribute to bordering practices. Security Studies and IPS worked to bring to light how technologies become relevant in the decision-making process (Bigo & Guild, 2005a; A. Hall,

2017). Profiling, as mentioned above, dominates the consideration of the database's role in migration governance, but the new actor working in this field is algorithms. Leese (2014) discusses how databases are not static entities but emerge through algorithmic profiling. This thesis has extensively addressed the role of algorithmic decision-making, but further into the infrastructure of the border lies the caseworking system Atlas. An infrastructural lens is helpful to consider how "the concept of mediation focuses our attention on the fluid relations among borders, state authority, technology, and mobility. Mediations concern more than technical connection or political and administrative cooperation; they point to the emergence of novel forms of power, authority, and control, new sociotechnical arrangements that affect existing political orders"(Dijstelbloem, 2021, p. 7). Mediation captures the sociotechnical power of databases to be the link between real-life objects, administrative officers and border decisions. As Leese (2014) explained, "database can be analysed and incorporated automatically. This fluidity signifies a major change in the conceptualisation of profiling, as it creates only momentary groupings that might disappear back into the white noise of the database in the next moment" (p. 503). The introduction of automation into databases' features how the profiling of a subject can be made visible or invisible by computer systems. Databases are not considered as just facilitating policy, but as components of shaping and forming new practices. As in the case of how databases were used to enact the Dublin Regulation, database technology can be considered as a socio-technical contributor to migration governance.

There has been research into the role of databases in the UK context. Parmar's (2019) work on the Hostile Environment policy draws on five years of research on police interaction with border work. Operation Nexus was a technological and institutional shift introduced through Hostile Environment policies that placed immigration officers in the police force and introduced the sharing of a database that checked individuals' citizenship status. Parmar (2019) draws on STS literature to argue that interactions with police officers and technology operate within a self-fulfilling racialised feedback loop. This feedback loop, as Parmar (2019) suggests, deepens the racialised and gender interactions with both migrants and individuals who "look and sound" like immigrants. Policing and immigration enforcement has long relied on stereotypical tropes, as discussed in Chapter Three. What is unique about the placement of technology in this space is that the racialised outcomes are, as Parmar (2019) argues, "frequently disproportionate in terms of race, gender and class, yet the accountability for such outcomes are diffuse and

paradoxically harder to trace and attribute" (p. 940). Parmar (2019), pairs the lack of accountability, neutrality and racialised results informed by the socio-technical relationship between immigration enforcement and data. This is how I frame the features of Atlas. In line with Scheel and Glouftsios (2021), I argue that the technologies, like Atlas, must be considered sociopolitical devices that are not discriminatory merely because of the policies they enact, but have design features that exacerbate bias outcomes. Glouftsios (2019) suggests that a database's design in migration governance is a "socio-technical assemblage constituted by agents whose anticipated relations and interactions are to produce specific performative effects" (p. 165). To understand Atlas as a socio-technical device we must consider how critical data studies views databases.

6.1.1 Database and Critical Data framework:

An intersection of migration literature and critical data studies captures the deepening of border logics and emerging power dynamics from the Atlas database. Migration literature shows the adoption of the context and history of using technology and data to control migration and the broader implication of fluid and porous border hierarchies (Martins et al., 2022; Ruppert, 2012). The labour, logics and infrastructural mediations at the border need to be further investigated as technologically informed. Previous migration literature adopted an STS-informed infrastructural reading of bordering practices that do not focus on the differential treatment of people based on protected characteristics - age, race, gender, class and sexuality (Dijstelbloem, 2021). Valdivia and colleagues (2022) shift the methodological approach to using computational practices to uncover the dispersed labour integrated into a database. This chapter contributes to the avenue of research developed by Valdivia and colleagues (2022) to use a data feminist approach of speaking to power and rethinking hierarchies.

Databases, as defined in Chapter Four, are not 'predetermined' but rather dynamic tools that can create silences, gaps and hierarchies of information (Kitchin, 2021). Data feminists suggest that "rather than seeing knowledge artifacts, like datasets, as raw input that can be simply fed into a statistical analysis or data visualisation, a feminist approach insists on connecting data back to the context in which they were produced" (D'Ignazio & Klein, 2020, p. 132). Power, based on the data feminist approach, considers how "structural privilege" is embedded into systems to inform the "categories" present in socio-technical tools. The pitfalls of data sharing and Atlas fall into two main categories 1) the changing of the systems has led to

double keying[11] and mismanagement of vulnerable person's data, 2) the use of internal sources of data DWP, National Insurance and DVLA. The latter shows a technically codified dispersal of the border that includes and uses UK citizens' data. This chapter accepts a database's definition and political power from a critical data studies perspective. Ziosi, Watson and Floridi (2024) use a genealogical approach, informed by the constructivist epistemology, to conceptualise algorithmic bias not through a single "origin", but rather a " broader set of social and technical conditions at play that (re)produce these disparities" (p. 3). I draw on a similar approach to Ziosi and authors (2024) to explore how biases can be introduced in an indirect manner and to catalogue how Atlas has been reported to be a non-functional technology. I start with the infrastructural change from CID to Atlas to reveal challenges of changing a technological system.

6.2 Infrastructural Story of Change: Case Information Database (CID) to Atlas

Atlas is the Home Office's attempt to resolve the old system of the Casework Information Database (CID). The Home Office reported that CID had failures in both "system and the data" and the new system Atlas proposes to fix these missteps with "more automated updates and less manual data entry" (Hill, 2019). The Home Office states:

> Atlas provides the front end to casework processing with actual data being stored and retrieved from a secure database platform called Person Centric Data Platform (PCDP). It is an in-house Home Office system on the Amazon Web Service (AWS) platform. Atlas is the 'product' that all feeds (visas, etc) will go into. This is so the system can be configured rather than rebuilt every time a new service comes online" (Home Office Enterprise Services, 2021b).

Simply, Atlas is the visual portal for Home Office workers. This "front-end" service consists of various technological features which transform the "data stored in PCDP" to become useful in migration governance (Home Office Enterprise Services, 2021b) . As the Home Office described, Atlas is fluid, everchanging to the new technological solutions developed. Before there can be an infrastructural description of Atlas, it is helpful to look at the history of CID.

Initially conceived in 1998, the database of CID has been at the centre of the infrastructure of the Home Office and its data-sharing practices. For two decades, the CID stored, analysed and processed the movement of people within and abroad in the UK. The

[11] Double Keying refers to the duplication of records, or assigning the wrong case information to an individual.

infrastructural mediations of CID are explored in Chapter Three. Under the Hostile Environment policies, the Home Office began to implement retroactive border control; this meant using data analytics to identify individuals who may not have status in the UK. As previously discussed, the consequence of retroactively bordering was the Windrush Scandal. In the aftermath of the Windrush Scandal a parliament committee noted the Home Office was aware a large proportion of the UK population did not have the identification to prove their legal status, passports or landing cards, and the department still implemented retroactive bordering practices (House of Commons & Committee of Public Accounts, 2019). Some of the Windrush victims encountered border controls as they applied for new jobs (Slaven, 2022), but others were alerted via a text message, or letter, that they did not have the legal right to be in the UK (Jones et al., 2017). One system that was used to "identify" individuals affected by the Windrush Scandal was the CID.

One of the processes to enforce the deportation or "voluntary returns" was for the Home Office to identify individuals who came to the UK after 1973; this would mean they did not come with British citizenship extended to colonial subjects (Gentlemen, 2020). CID was the database that aided in producing the invisibility of Windrush victims, who were told countless times there was no "proof" of them living in the country (Gentleman, 2019). The destruction of landing cards, as discussed in Chapter One, was one of the malpractices of the data process that led to the Home Office stripping of citizenship claims of the children from the Windrush Generation. In the aftermath of Windrush, poor handling of data is cited as a major contributor resulting in wrongly stripping individuals of their citizenship rights. From this recognition of poor data quality contributing to racialised outcomes, the Home Office turned to techno-solutionism to respond to critiques of their data systems.

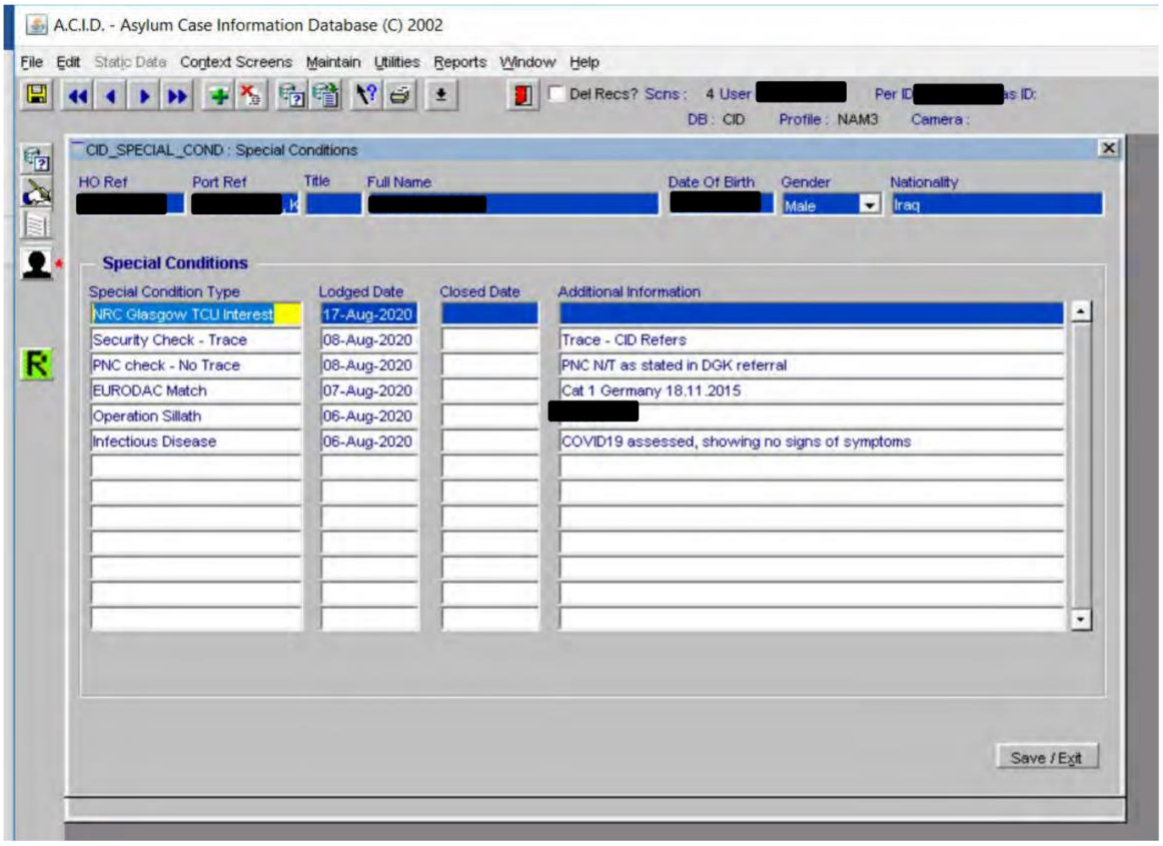
In a Parliament Committee (2018) meeting assessing the steps the Home Office were implementing to assure another Windrush did not occur, particularly in light of the status change for EU nationals in the UK, post Brexit. A pattern identified by the committee is the Home Offices inability to assure data quality in their IT systems. CID is frequently mentioned by Williams (2020) and the Parliament Committee(2018) as a problematic database that has a lack of centralisation and outdated features. Fear, as Gentlemen (2018) argues, was a tool used by the Home Office to scare individuals in the UK with uncertain immigration status. One tactic the Home Office used to spread fear to individuals was sending text messages, assisted by the private firm Capita (Gentleman, 2019). The database used by the Home Office to "find" the

Windrush victims was a compilation of refusals from CID, curated into another database called "The Migration Refusal Pool" that was handed over to Capita to track the records and convince individuals to leave the UK (Vine, 2014). The ICIBI reports:

> In October 2012, the Home Office awarded Capita the contract to assist with the contact management of 150,000 MRP cases. Their remit included contacting individuals to encourage them to depart the UK. They were also tasked with closing and updating the CID records of those individuals who were known to have left the UK, and straightforward caseworking tasks on a further 50,000 cases to prepare these cases for a decision by Home Office staff. Capita's work has since been expanded to deal with a wider range of MRP cases, both current refusals and pre-2008 cases" (Vine, 2014, p. 14).

I include the history of the CID with the Windrush to frame how databases, even if they do not have "automated" features, can become tools to perpetuate exclusionary politics. As the Home Office defends their previous actions and promises to never allow another Windrush Scandal, the department cites data quality as their fatal flaw. In blaming the technological features of a database for the consequences of retroactively enacting borders, CID becomes the issue, technology is to blame. For the Home Office the solution to overcome the poor quality is a new database- Atlas. After a failure in 2013, which cost 347 million pounds (K. Hall, 2018) , various private institutions were contracted to redesign the case working system. In a report, Hall (2018) interviewed an individual within the digital transformation team who reported, "CID is probably top of the list for replacement in a world of Brexit and even without Brexit. The current system is a mess from the '90s and looks like it. It runs across Citrix client-server technology, which is unstable and accident-prone - daily or even hourly outages are common with complete loss of work" (Hall, 2018). Under the category of projects called "Immigration Technology Portfolio", the work to streamline the CID emphasises a new, sleeker and more efficient system. Below shows what CID looks like for the caseworkers.

Figure 14: Case Information Database

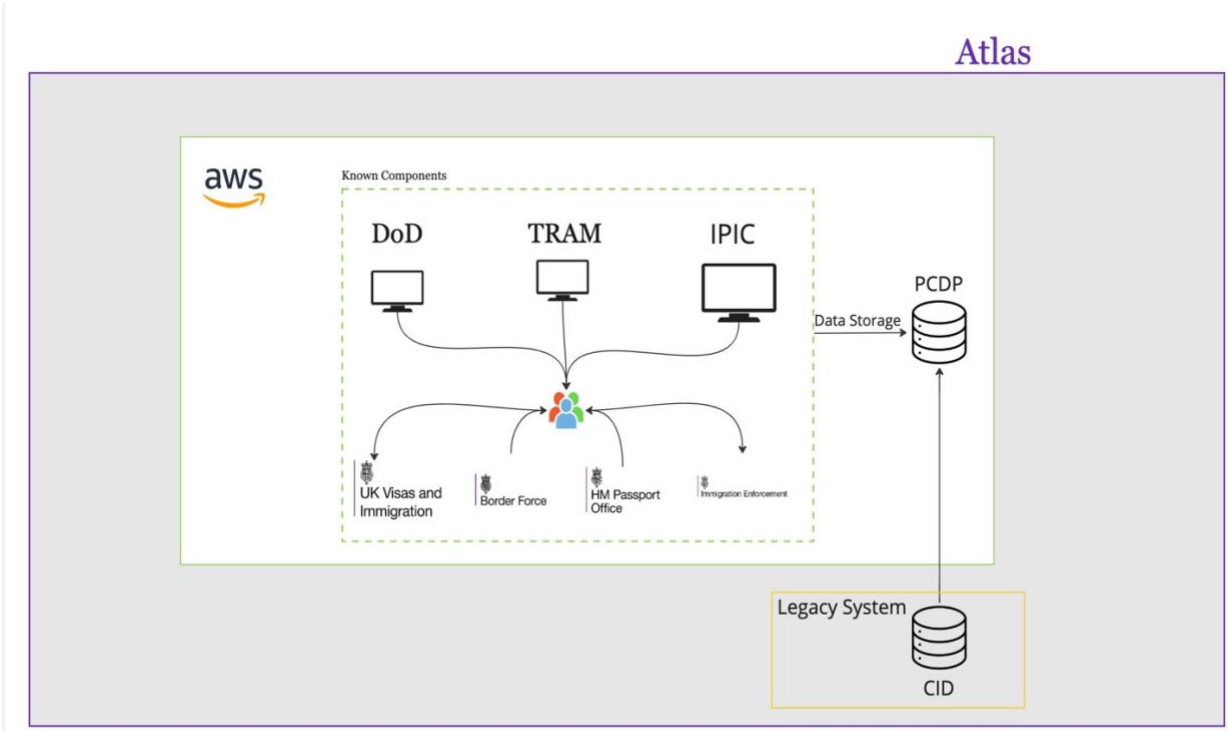


This figures of CID shows the integrated data streams into the infrastructure of CID (UK Visas and Immigration, 2020). Present in the profile being built on this unnamed Iraqi man are data points from the Police National Crime database. From the image of CID, we can visualise data sharing. In the third row from the top, 'PNC Check – No Trace' the Police National Computer (PNC) and demonstrates how internalise data sharing are cumulated into the previous case working system. There are current internal policies with the features of Operation Sillah, an initiative of the Home Office to "track, manage and report on the cohort of small boat arrivals from 1st January 2018 onward" (Hepple & Tierney, 2020). There is reference to the data sharing between the UK and EU with the fourth column, 'EURODAC Match'. Finally, there is the presence of biometric data collected based on COVID-19 restrictions on mobility. In an instruction guide for caseworkers, there are step-by-step instructions on how they interact with the profiles presented to them in a database (UK Visas and Immigration, 2020). These rows and

columns of data presented to the case worker system operate as the verified truth regarding the anonymous Iraqi man, as this is his profile and case with the Home Office. From understanding how data sharing is visualised for Home Office workers we exemplify the role databases have in presenting dispersed information into a singular profile. The changeover from CID and the creation of centralised profiles for individuals came from concerns about the system's appearance and the efficiency of the database.

To overcome this barrier of information and scope, the approach to understanding Atlas is to take a broad view of how Atlas contributes to the feedback loop within the border infrastructure and the pitfalls of data sharing. I inquired via a FOI request about the scope and cost of the database systems within the UK Visa and Immigration system. The Home Office replied, "[T]here are currently in excess of 90 different casework systems used within the " space"(Digital, Data and Technology, 2022). Atlas has "2.6 million records annually" (Home Office Enterprise Services, 2021a) and is used regularly by various agencies within the Home Office, like the Immigration and Enforcement and Passport Office. While there is limited information on the access other departments have to Atlas, I suggest disrupting the image of Atlas as a seamless web; it should instead be seen as a fractured, patched system with gaps of accountability due to automated features of the database. A systems map of the Atlas system is below:

Figure 15:System Map of Atlas



6.3 Atlas and Automation

To overcome the complexity of the automated features of Atlas, I unpack the few tools that have been revealed to the public. I begin with a feature integrated into Atlas designed to assist Home Office caseworkers track their progress on immigration cases. Neal reports (2024) "the concise interview project (CIP) saw the implementation of 'streamlined Atlas'. This new functionality to the Home Office's database allowed for automated decision making through Atlas, specifically for grant decisions, which could be generated through the system" (p. 73). As we explored in previous chapters, increasing automation through the Streaming Tool and Sham Marriage resulted in racialised outcomes for visa applications. As automation becomes integrated into the caseworking system, we can hypothesise that there may be similar discriminatory results. Automated features are obscured in the technical infrastructure of Atlas, like in the dashboard used by Home Office employees.

Automation, like the algorithms previously discussed in Chapter Three and Chapter Four, and databases should not be thought of as separate entities. One of my goals in this chapter is to

break down the conception that databases are benign entities. Atlas should not be considered a fixed entity that placidly transmits various data sources to the caseworkers at the Home Office. In the back end of Atlas, several automated tools are working to mediate the data to the caseworker, resulting in outcomes in migration governance. In a blog post titled "Digital Transformation at the border" the Home Office advertises Atlas as follows:

> Atlas automates large parts of the immigration casework process and will ultimately **eradicate the use of paper**. Information from historic case files have also been migrated onto the new platform so case workers can easily access all the data they need to. Our colleagues can now spend more time identifying potential security risks, ensuring the safety of the public. Meanwhile applications of those who are migrating to the UK are dealt with far more swiftly, thereby improving the user experience (Thompson, 2023, bold added).

I emphasise the eradication of paper for two reasons, as this connects to the main critique of the creation of the *Digital* Hostile Environment (Foxglove, Liberty, et al., 2021). Foxglove (2021) and the organisation the3milion (2022) argue the lack of papers and status, with the increased need for residents to prove their ability to work, creates a perfect storm of perpetuation of exclusionary politics. As a Tier 4 visa holder, my status is stored in Atlas, and I have a Biometric Resident Card that I can use to prove my status. Without the physical card, or the eradication of paper trails, when an individual encounters the numerous internal border checks there is a **forced** reliance of the migrant, and a purposeful reliance on technology by the Home Office. As Chapter Four and Chapter Five prove using automated tools, based on historical immigration data, replicate and reproduce discriminatory outcomes. If the system does not work, as has been recently reported in the *Guardian,* people will not be able to prove their status and access employment, healthcare or benefits (Taylor & Dyer, 2024). To begin to reverse engineer and consider why some of the errors may occur we can begin to think about the infrastructural compromises and negotiations that create all digital technology within the Home Office. Booth (personal communication, 31 March 2022) reflects that the problem with Atlas is that often we only pay attention to technologies when bad things happen. Yet, based on the massive technical infrastructure and the lack of recognition that automation is reinforcing historical social patterns, we can hypothesise there will be issues. I begin to identify how the integration of automation for the function of Atlas may be poised to reinforce the findings of Chapter Four and Chapter Five, the replication of racialised bias.

6.3.1 Business Rules

Previously the discussion on automation referred to algorithmic systems that had documented bias outcomes. From the context of Chapter Four and Chapter Five, examine how the Home Office is integrating automation into the caseworking system. Business decisions, or business rules, is a term often used in internal Home Office reports (Home Office Enterprise Services, 2021a). In the construction of automated technology, business rules "provide the foundation for automation systems by taking documented or undocumented information and translating it into various conditional statements" (IBM, 2023). Infrastructurally, business rules mediate the goals and desires (codified and uncodified) of the Home Office into their technological tools. Business rules are the templates that direct all automated features used by the Home Office.

The business rules of the Home Office articulate the interest of the Home Office to rank, criminalise and sort individuals with their automated technologies. The Home Office states that:

> Immigration Enforcement's (IE's) vision is to reduce the illegal migrant population and the harm it causes. To support this, a systematic rules engine is under development to better identify and prioritise cases that can be progressed through completing one or more interventions. The creation of the 'business rules' digital service aims to produce an easier, faster, and more effective way for IE to coordinate services across the business. A primary focus of the development is to create a high-level set of rules which define who is of interest based upon" (Immigration Enforcement Secretariat, 2022).

Business rules in this context operate to transform socially informed ideas of illegalised populations to what the technology systems should prioritise. Business rules are the standardisation of conditions that inform all automated tools. Algorithms are often compared to a recipe (Broussard, 2019). If you take the simile of an algorithm as a dish recipe, business rules are the standardisation of said recipes. Business rules consider the explicit and implicit desires to standardise all the recipes in a cookbook, so in the case of a "vegan cookbook", the business rules would inform all the recipes to exclude animal products. Business rules for the Home Office inform all the future automated tools built to support bordering practices. One aspect raised on the business rules is that these rules are informed by "various personal characteristics (such as age and nationality)" (Ozkul, 2023, p. 36). Embedded now, for Home Office technologies, is the standardisation of all automated tools, which will have to build towards "sorting out" and defining individuals who fit into the political negotiation category of threat.

Daniels (2015) argues that standardisation of automation and "databases" introduce a "colour blind" to reinforce racialised results whilst similarly maintaining that technology is "race-less". Automation does not always directly draw from protected characteristics (race, gender, age).

Eubanks (2018) provides a historical analysis of technologies used to control welfare that are hidden under the guise of "streamlining services". These technologies of control persist in the present-day Home Office, regardless of the agency's stated desire to provide efficiency to migration governance through its new case working system. I mirror Eubanks' (2018) hesitation that efficiency does not equate to equity and the focus on the historical lineages in digital technologies. The technology of storing, presenting and applying data resources in a migration context is not new; what is new is how the technologies can disperse and reinforce structures of exclusion in an invisible manner. Eubanks (2018) suggests that "if the old surveillance was an eye in the sky, the new surveillance is a spider in a digital web, testing each connected strand for suspicious vibrations" (p. 131). By examining the business rule as the building blocks for automated tools in the Home Office, we can test the "vibration" on the digital infrastructure as being poised to reverberate racialised outcomes. Below visualises the black box the Home Office places over the "direct discrimination" that occurs under the business rules:

Figure 16: Business Rules Redaction

Race (also includes nationality and citizenship)

Direct Discrimination – We acknowledge the use of nationality is tangential, [redacted] It is worth noting nationality within the 'business rules' is based purely on status, and no predictive element is associated with the too [redacted]

In addition, some users have the capability to further filter the cases recommended via the 'business rules', by nationality. This is for operational purposes such as ascertaining which cohort of individuals would be suitable for a Charter Flight initiative.

Please note that flight availability, [redacted] are managed by the business and are not part of the functionality of IPIC tool. However, as IPIC provides users the capability to filter cases by nationality to carry out core functions, it could be perceived as directly discriminating.

Indirect Discrimination - IPIC does not indirectly discriminate on this protected characteristic.

For IPIC users – Access to IPIC is based on business need only. IPIC does not directly or indirectly discriminate against users on the basis of race.

(Immigration Enforcement Secretariat, 2022)

Present in the underlying logics of all automated tools, in Atlas and beyond, is a similar articulation of race being a feature that Home Office workers can filter, search and identify based on nationality. Chapter Four and Chapter Five prove algorithms can produce racialised results with or without direct inputs into the system. From this understanding that the building blocks of all automated tools for the Home Office may filter, sort and rank based on nationality illuminates how the infrastructure of the digital systems for migration are poised to reinforce racialised outcomes. Chapters Four and Five demonstrates how even without the direct input of race, into an automated system, can result in racialised outcomes. Simply put, the desire to increase automation within the border builds off the infrastructure of filtering, hierarchising and sorting migrants based on biassed notions; what is new is the technical opaqueness that the operations occur.

Below is a statement from the Home Office claiming no automated decision-making is present in Atlas.

Figure 17: Home Office Response to Automation in Atlas

3. Automated decision-making with legal or similar significant effect:

Processing that aims at taking decisions on data subjects producing "legal effects concerning the natural person" or which "similarly significantly affects the natural person".

☐ Yes ☒ No

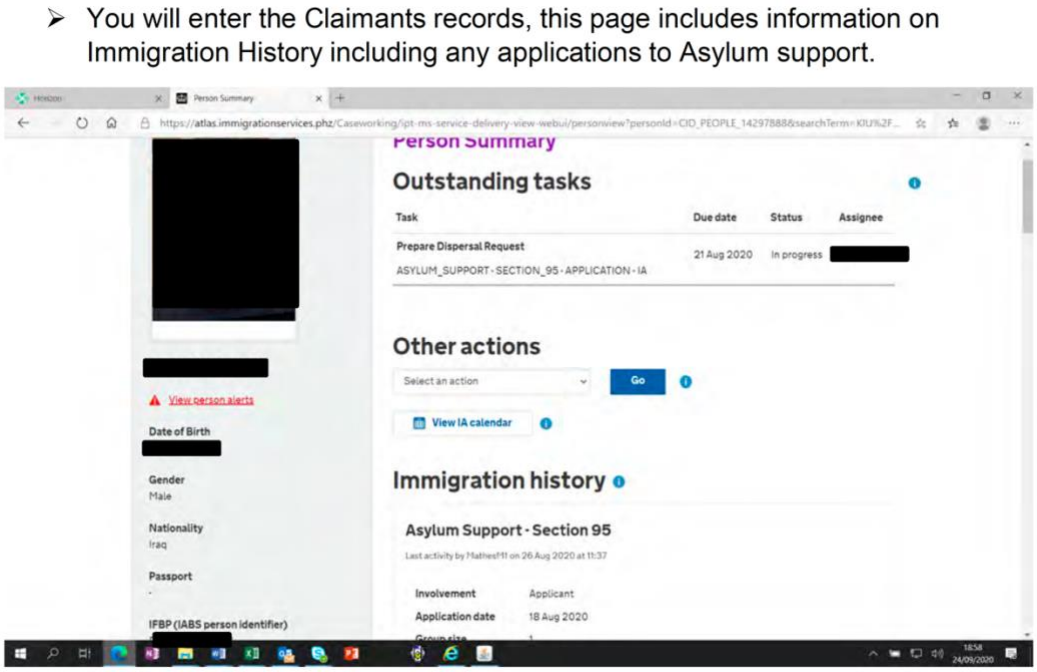
Whilst some of the processing of personal data may involve automation of some process steps, based on approved business logic, overall decisions (particularly where there is a negative consequence on the data subject) are always performed by a human caseworker

(Home Office, 2021b)

Decision-making and automation have blurred boundaries, often not considering the relationship between the actor, the technology and the infrastructural context. Automation bias is primarily discussed in Chapters Two and Three. Atlas and automation mainly offer a device to deconstruct how automation is deeply embedded into the infrastructure of the Home Office and questions how private actors play a significant role in constructing the network of tools.

By examining the connected tools used in Atlas, TRAM and IPIC, the logics of the Hostile Environment emerge in the operations of the algorithms. A related algorithm to Atlas demonstrates how databases are infrastructurally fluid and have automated features. The Daily Operations Board is one of the features of Atlas: "the Daily Operations Dashboard (DoD) is a tool for managers within Atlas to track the tasks assigned to caseworkers and their daily actions and decisions. The DoD will provide a set of visualisations to inform **better business decisions** by Case working manager" (Home Office Enterprise Services, 2021, bold added). Below is a visualisation of how ATLAS presents "tasks and profile summary" of migrants.

Figure 18: Atlas System



(UK Visas and Immigration, 2020)

Figure 18 gives insight into how features like DoD organise the decision making process for caseworkers. By automating the DOD, the infrastructure and presentation of tasks for case workers is embedded with invisibilised features of categorisation and hierarchisation of persons. The Home Office (2023) states:

> the triage tool: this is the TRAM[12] (Triage and manage) part of the online service for the IEBR Programme will enable the IE workforce by identifying cases, triaging them, and then recommending them as suitable for a particular intervention or service in a consistent, holistic way. This will be delivered via a digital tool called IPIC (Identify & Prioritise Immigration Cases). The TRAM and Define data sets provide data for IPIC but will also be used for analytical purposes (Immigration Enforcement Secretariat, 2022).

This tool is the mediation between the aforementioned "business rules" and a digital service used by caseworkers in Immigration Enforcement to take necessary actions. I argue that Eubanks' (2018) articulation of a database working to "predict" and profile subjects reinforces the border's discriminatory structures. This tool is fed data from Atlas, to be presented back to Atlas based on

[12] There are two types of spelling used by the Home Office and the ICIBI that refers to the triage tool, TRAM and TRaM.

an automated tool that uses technically opaque features. Implementing an algorithm to suggest relevant "filters" uses protected characteristics such as "nationality, age and gender". This, along with redacted charters into the Atlas system, streamlines caseworkers' processes to categorise migrants(Immigration Enforcement Secretariat, 2022).[13]

The TRAM and IPIC service has a second-round trial in Solihull in 2018, the ICIBI describes the technology as a success for increasing the efficiency of processing of cases yet flags the potential harm from the use of CID data, as the quality of the information is questionable. "The Triage Management tool (TRaM) is a large database containing 'live' cases. The data can be filtered using 10 different fields. Due to the low number of referrals of actionable cases, ROM staff were using the tool to generate work for themselves, filtering cases, assessing current status, and progressing the case if appropriate, which might entail signposting it to the case owner" (Bolt, 2019, p. 14). The Home Office states that these systems work together. A description of the tools by the Home Office clarifies:

> TRAM enriches this data (details on immigration case) based on set criteria to inform triage options. IPIC will apply a set of 'business rules' to this data and present cases to internal users in a prioritised way for consideration of an intervention/action. This provides efficiencies and staff time can then be spent on value-added activity for example, undertaking the interventions recommended and not manually searching for the next case. Data will also be used for analytical purposes (Immigration Enforcement Secretariat, 2022).

As the connected automated system processes, analyses and filters the data presented to the Home Office caseworkers, via Atlas, the question becomes what is the goal behind the use of technology? Present in the above quote is the promise that as time is freed up for the caseworker, actions towards cases will be increased. By linking the increase of automation to the underlying goal of the policies and actions of the tools deepens our understanding of how the *Digital* Hostile Environment emerges from the use of technology at the UK border.

One of the Home Office's justifications for increasing automation in filtering and assigning application to different teams is to increase the rate of "voluntary returns[14]". In

[13] Filtering and ranking dictated by automated tool are explored in more depth in Chapters Four and Five

[14] Voluntary returns is one of the policy that the Home Office pushed for during the Hostile Environment. This was a scheme through fear and restricted access to services the Home Office hypothesised people without regularised status would voluntary return. Extensive literature on the politics of deportation can be found here (De Genova, 2010; Jansen et al., 2015). Crucial for the current discussion is the omnipresence of Hostile Environment directives in the operational logic of a feature of Atlas.

response to the ICIBI report the Home Office claims the department is improving the strategy for voluntary returns by:

> utilising the resources (TRAM and IPIC) freed up by automation to conduct additional voluntary departure interviews with potential beneficiaries of the scheme and we have upskilled our staff to do this. We also plan to use the IPIC tool to identify people who may be suitable for promotion of a voluntary departure (Home Office, 2019).

A key policy directive of the Hostile Environment was to increase "voluntary returns". As identified earlier, the drive, by the Home Office, to incentivise individuals to leave created the practices resulting in the Windrush Scandal. Present in automated tools TRAM and IPIC is the application of automatic features to assist in the directive of incentivising voluntary returns. I build on the previous chapters, to continue to problematise how algorithms contribute to legitimising categorical power at the border. TRAM draws parallels to the Sham Marriage tool, discussed in Chapter Five, as the tool applies different filters, to the immigration data to inform how the Home Office caseworker interacts with the application. Data sharing facilitated by Atlas has automated features.

Atlas now contains an "automated data sharing feature" for all asylum seeker data with the United States, Australia, Canada, and New Zealand known as the Migration 5 (M5). In a published manual for caseworkers navigating the change from CID to Atlas, the instruction "In Atlas, in Person Summary View, open the asylum case, view the case details, and find the 'International Biometric Results' service delivery in the Case History section. This will show whether and when a check has been made, and whether there was a match" (Home Office, 2023b). The manual states that since 2009 "100 %" of asylum seekers' biometric data (fingerprints) were automatically shared with the US, with more automation to other M5 countries (Home Office, 2023b, p. 6). The reinforcement of accepting automated identity is codified within the training material for Atlas. The Home Office states, "false identity details must be recorded as aliases on the CID Person screen, using 'International Biometric Match' as the alias type. Aliases identified in automated responses will be automatically recorded in Atlas. If an alias is later accepted as the true identity, all other identities must be recorded as aliases" (Home Office, 2023b). Incorporating features of automation into the identity verification process with foreign countries deepens the infrastructural integration of machine learning in hierarchising individuals. The automated identity verification brings the decision to the "Asylum interview" for the applicant to explain. International data sharing has been discussed as a threat

for individuals to be falsely placed in a "risky category"(Amoore, 2013; Aradau & Blanke, 2022; Stachowitsch & Sachseder, 2019; Valdivia, Serrajòrdia, et al., 2022). In alignment with the arguments built in previous chapters, the automated features of Atlas illuminate the possibility for similar outcomes. What is different is that the database does not have one algorithm or tool it is using, in the form of machine learning, to rank, filter and hierarchise data. Rather, there are multiple ambiguous tools embedded into the system. As the automated features become weaved into the main case working system, in a technically opaque manner, the task of tracing the impact of machine learning at the UK border becomes more complex. As the technically opaque nature of automated features of Atlas have been explored, there now can be a consideration for how data errors perpetuate harms.

6.4 Data Errors

In December 2021, I received a response from the Home Office about using their cloud databases. In my initial search for information about cloud services, which the Home Office does use, I received a DPIA of the new database Atlas. One of the significant infrastructural changes is merging databases containing asylum seeker data with other migrant data. Atlas "processes a number of sets of OFFICIAL (with a sensitive caveat) personal data including, but not limited to, criminal convictions, financial details, religious, political and health data. This information falls into the special categories of personal data. However, this is not the majority of the data (Home Office, 2021d). Storing personal data in a migration database is not new. What is different about Atlas is the integration of asylum seeker data in Atlas.

The storage of asylum seekers' data poses threats to a vulnerable population within the UK, not being adequately considered in the technological transformation of the Home Office. CID used to have separate systems for asylum-seeker data and non-asylum-seeking individuals. ICIBI (2021) reported that the change in "legacy IT was developed in silos, meaning officers are required to duplicate information across multiple systems" such as CID and Atlas, and the "significant manual inputting of information creates opportunities for human error" (p. 51). The ICIBI's (2021) findings were mainly directed at officers operating at the entry ports of the UK; for individuals arriving in small boats, and the officers making decisions, logging details must now consult two systems (CID and Atlas). In the case of small boat arrivals, "all ten fingerprints" are taken from the individuals and logged into CID and Atlas (Neal, 2021, p. 16). The infrastructural chaos of changing the centre of the case working system is discussed above, but

intersecting here is a component that is now integrated into classification claims of asylum seekers' biometrics data. Atlas is now integrated into the internal governance of asylum seekers in and out of detention. Recent reports from ICIBI (2022) report how failures in Atlas, as can be seen in detention centres in the UK, have resulted in a lack of medical attention.

The ICIBI (2024) recent report on the impact of Atlas focuses on the technical failures of the system in managing asylum seekers. While my thesis does not focus on asylum seeker governance, I draw on the ICIBI reports on the case management of asylum seekers, as Atlas is an integrated system, meaning the functions are the same for non-asylum cases. By examining how there are now reported concerns from the caseworking team, and the ICIBI, the harm of Atlas becomes crystalised. The ICIBI (2024) reports:

> Atlas, as it was important for them to be able to accurately record information relating to safeguarding concerns and any actions taken. They told inspectors that they had to find a workaround to accurately record information. Each data entry box on Atlas had a character limit of 999, and the template minute that they typically completed almost reached this limit alone. Consequently, they had been instructed to summarise the information, which they said could be "very dangerous", as it could potentially omit important information that a DM could require at a later stage. A member of the team emphasised the risk that arose when the "technology dictates the process, rather than the process guiding the technology" (Neal, 2024, p. 82)

Concerns that the "technology is dictating the process" summarises the critique of my thesis: that as technology is embedded into the infrastructure of the Home Office, the digital tools become increasingly influential in dictating border processes. As ICIBI (2024) findings on the "workarounds" that the caseworkers implemented to attempt to record accurate migration suggests, the collection of data in this way forms a dangerous pattern. Persons with insecure status may be negatively impacted it. One of the major issues with data processing is the issue of inaccurate transfer of data from CID to Atlas (Neal, 2022).

Data errors in the management of asylum seeker's medical needs demonstrates the stakes of inaccurate, or delayed, information about individuals in the caseworking system. ICIBI (2022) reports that the transfer of "Detention and Case Progression Review (DCPR) to Atlas (Home Office case working database). Inspectors found that in 15 of the 50 cases (30%), the R35 reports had not been uploaded to the case record" (Neal, 2022 ,p. 31). There were reports of "2 cases" in the incorrect files uploaded to the wrong individual "case file" and that in "6 cases", there was no relevant information about the medical attention needed for the individual cases (Neal, 2022).

Kitchin's (2021) emphasis that database design can create "silences" and "gaps" is exemplified in cases where individuals' biometric data directly relates to their ability to receive necessary care. Infrastructurally, ICIBI's (2022) report sheds light on how data-collecting practices in detention centres are "poor and lack consistency", can provide feedback into decisions on someone's asylum claim or potential deportation from the UK (p. 33). The Home Office describes the process of uploading fingerprint data onto Atlas as "locking in" the identity of the asylum seeker (Home Office, 2023a). The impact Atlas has on asylum seekers sheds clarifies the concerns over data accuracy regarding the identification of migrants.

The ICIBI (2022) found that there are informal practices in detention centres to have internal spreadsheets contain caseworkers "versions of the truth" (p. 12). The Home Office managers were "cognisant of the problems with data and noted that authority had been given for a data cleanse to be undertaken prior to Atlas going live" (Neal, 2022, p. 44). The data cleanse, the managers are referring to fixing the "double keying" issue, which has been outsourced to Deloitte (Home Office, 2022b). The role of Deloitte will be further explored in the next chapter, but this outsourcing illuminates the chaotic, disconnected and fractured infrastructure maintaining the details of vulnerable populations. As ICIBI (2024) found in practice, the change and methods of Atlas being tested before "going live" in the detention environment reveals the gaps and silences formed through the socio-technical practices of the Home Office and technology. What is occurring in practice, lack of medical attention and dispersed sources of "truth [15] mediated through Atlas is supported theoretically by the incompatibility with biometric databases and equitable migration governance. As Parmar (2019) demonstrates, the interaction between the database, officer and migrant becomes one in which the technological output is prioritised. The prioritisation of technical information and data offer the exact context at stake: Atlas is the constructed truth-teller in migration governance but is technically flawed. Truth statements from the technological device foreground the importance of uncovering the various components of Atlas' infrastructure. For validity to come from a database as large as Atlas, glitches, data errors, and faults can emerge in the smallest component to feedback an incomplete truth.

[15] Truth here relates to identity claims of migrants. As the truth mediated by the case working system relates to how the Home Office manages the information of all migrants in the UK. To illustrate this notion of truth/identity claims, think about how one would go about proving they are themselves, if the database does not agree. For if Atlas has an error about the identity of Kaelynn Narita, how do I prove this truth of the Home Office is incorrect?

ICIBI (2024) discovered that the roll-out of Atlas has resulted in a myriad technical failures that result in a delay in Home Office workers processing migration cases. As Atlas, and the increasing automation, was promised to "clear the backlog" and make the immigration process more "efficient", the failure of the database underscores the failure of the techno-solutionist ideals of the Home Office (House of Commons & Committee of Public Accounts, 2019). ICIBI (2024) reports:

> The other error prevented case progression and decision service when the claim appeared as 'system user' in Atlas. A member of the workflow team said that 'system user' appeared when Atlas placed a claim on hold to process the most recent action, to avoid anything else on the case being processed at the same time…A member of the workflow team told inspectors that this error happened to every claim when it came to booking an interview and therefore it was something they had "come to expect". As a result, they had incorporated the five-day delay into booking an interview to ensure cases were ready by the day of the interview. There were also instances of claims being stuck in the system for longer periods of time. One DM told inspectors they had a claim showing as 'system error' for two months that could not be progressed. They had to tell the claimant's legal representative that the delay in serving the decision was due to a system error, and said it made them look "incompetent". A senior manager told inspectors that, as of September 2023, there were around 139 decisions in their DMU that were stuck in Atlas and could not be served, despite the decision having been made and written. A manager in another DMU told inspectors they had 65 cases that had decisions ready to be served, but 90% were stuck in Atlas with the 'system user' error (p. 87).

Atlas errors have become "except(ed)" by caseworkers and contribute to the delay in processing migration cases. From the technical failures of data processing by Atlas the impact of technology is reinterred, and must be viewed through the infrastructure of the bordering process. For delays in processing visas have human impacts, psychologically and materially (Taylor & Dyer, 2024), as will be explored further later in the chapter, and contribute to, as Boswell and Badenhoop (2021) argue, state ignorance. Boswell and Badenhoop (2021) frame the ignorance produced by states as a form of rationalisation, or oversight, that can be mutually constituted with private actors. ICIBI (2024) reports flag the operational failure of Atlas in the asylum setting. There can be a broader consideration for how the exportation of designing and maintaining Atlas contributes to the pattern of the Home Office's sense of "resignation: this represents an uneasy combination of recognising state ignorance, while maintaining that there are insurmountable obstacles to overcoming it" (Boswell & Badenhoop, 2021, p. 338). As the data errors mitigate the process of migration governance, we can build on the argument to shed light on the issues of

Atlas being designed to ‘streamline’ internal data sharing between the Home Office and other UK public governance agencies.

6.4.1 Internalised Data Sharing

The Hostile Environment policies rely on data sharing between the Home Office and other governmental and public agencies to make the UK inhospitable for migrants. The Home Office (2016a) clearly states this:

> The high volume data sharing programme's priority is to embed systematic and large-scale data matching arrangements with partners where appropriate so they can make informed decisions on whether to deny, revoke or terminate access to benefits and services. This contributes towards the 'hostile environment', which makes it harder for people to live and remain in the UK illegally. The programme also works to build awareness and ensure that partners have robust systems and processes in place to protect benefits and services from immigration abuse and increase compliance with the rules (p.16).

Data sharing under the Hostile Environment began with a memorandum of understanding (MoU) between the Home Office and public organisations like “The National Health Service (NHS), Driver and Vehicle, Licensing Agency (DVLA) and Driver and Vehicle Agency, Transport for London (TfL) Taxi and Private Hire Vehicle Licences, HM Revenue and Customs (HMRC), Department of Work and Pensions (DWP)” (Home Office, 2016a). These MoUs set the infrastructure for the spread of internalisation of bordering practices in the UK. Work on data sharing and the Hostile Environment has discussed broadly the possible repercussions for minority populations (Coddington, 2021; Griffiths & Yeo, 2021; Waterman et al., 2021). What is not considered in these critiques of data sharing in the Hostile Environment is an emphasis on the infrastructure needed to implement the policy. Corporate Watch (2018) uses the term “hostile data” to denote the connection between perpetuating the Hostile Environment and sharing information throughout the UK government. Metcalfe (2022) translates the concept of hostile data to show how the feeling, the belief and the knowledge by migrants that data is shared throughout the government impacts everyday interactions with the state. I draw on Metcalfe’s (2018) academic interpretation of hostile data to problematise the experimentation with data infrastructures, whilst emphasising the means that data sharing becomes a driver in “exclusionary politics” (p. 228) for non-UK citizens.

What is new about the case working system is that the database attached to automated processes are all assembled into one centralised space. As my thesis argues, a *Digital* Hostile

Environment creates gaps and spaces in the infrastructure, making accountability for decisions difficult. By investigating the Home Office's central portal for all decision-making, casework, and management of migrants operates, there can be a deconstruction of how truth and knowledge are maintained. In the Atlas DPIA, the Home Office revealed that:

> Whilst data is combined from different data sources, the question is answered as a "No" because this is not beyond the reasonable expectations of the data subject. Data sets are matched and combined from different sources (primarily other government agencies and departments) in line with the Home Office Privacy Information Notice to augment the core data set provided by the applicant (Home Office, 2021d)

Present in this formulation of data risk assessments is an understanding that various flows of data are fed into this system. However, what is 'black-boxed' is the exact government agencies that have access to the database.

What is made to be opaque is the agencies that can *access* the Atlas data. It can be inferred that data from the agencies, "The Department for Work and Pensions (DWP), Her Majesty's Revenue and Customs (HMRC), the Department for Education (DfE), and the Department of Health and Social Care (DHSC)", are omnipresent in Atlas as there have been inter-governmental exchanges documented (Bolt, 2018a, p. 5). Atlas mediates data exchanges to other UK public agencies, yet the exact nature and agencies involved are not fully transparent. The Home Office reports that "Data stored on Atlas/PCDP may/will be shared with OGDs (Other Government Departments), but those arrangements are subject to their own DPIAs and MoUs, where these are already in place they will be updated / amended as appropriate" (Home Office, 2021c). In the same DPIA, it was reported that the nature of the data sharing with other governmental agencies includes "Data extract, reporting exchange/feed and direct access" (Home Office, 2021c, p. 30). Forging ubiquitous data flows with the new casework system that spreads out the dispersed features of all UK public governance. The Passport Office uses one aspect of Atlas and data sharing to "establish the identity and eligibility of individuals, their offspring and other linked family members applying for a British passport" (Home Office Enterprise Services, 2021b, p. 25). As mentioned, Atlas is fluid and built to be flexible for new products to be added to the system, as it is the front end of the case working database. Atlas using data, and traceable social relations, from an invisibilised site positions the system to be poised as the central feature of the *Digital* Hostile Environment.

Within Atlas is the notion that "the informational interconnectedness facilitated by digital infrastructures produces a form of 'data promiscuity'... Data promiscuity seen as data on a thing for one purpose can always become seen as data on another aspect of that thing and be used for another purpose and by another user" (Hoeyer, 2020, p. 2). Notions of data promiscuity concerns can be found in the infrastructural examination of borders (Dijstelbloem, 2021) there is a deconstruction of data flows as a "seamless web", but instead, the nature of database infrastructure is "patchy" full of "tensions and compromises". Kornberger and Bowker (2019) offer that infrastructure fuses beyond the material, social and public-private boundaries by emphasising data as knowledge.

As introduced in Chapter One, one of the instances of techno-solutionism occurring in the transition into a *Digital* Hostile Environment was the processing of EU citizens having the right to remain, post Brexit (Maxwell & Tomlinson, 2022; Tomlinson, 2019). This process used automated data matching algorithms to check data from "HMRC and DWP" to determine whether the person had lived in the UK for five years before the UK left the EU settlement agreement (Tomlinson, 2019). Automation has been covered extensively in this thesis in Chapters Two and Three; what has been less discussed is the repercussion of a digital only status. A digital only status, the switch from having physical cards that prove a person's right to reside in the UK to an online system, that relies on faulty data systems, like Atlas, poise threats to a lack of access for migrants. From the clarification of how the automated feature of Atlas may contain features of bias there can now be a discussion on human impacts of faulty databases.

6.5 Atlas Discussion: Humanise

A recent report from the *Guardian* shed light on the errors of the Atlas system, as well as the human impact of migration case working systems not working (Taylor & Dyer, 2024). We have covered the technical features of Atlas that infrastructurally contribute to the faultiness of the database, bad data sharing practices, various sources of information and the increased automation. To avoid a tautological argument, what is at stake is how the classification logics of technology are not discriminatory because of the Hostile Environment policies. Data sharing and automated features in the space of verifying migration decisions results in unjust outcomes, which can be seen in personal stories of individuals subjected to unjust practices. I use the stories

from Taylor and Dyer (2024) to reiterate the need to consider border technological systems with the impact on individual's ability to move, live and visit the UK. Taylor and Dyer (2024) report that a student from Nicaragua, Jorge Gomez, like "tens of other thousand migrants" had his records "merged" or lost with other people's data. As migrants must prove their ability to work, via immigration records, Gomez was unable to gain employment for three months (Taylor & Dyer, 2024). Data errors in the Atlas system demonstrate the harm of the intensification of border checks throughout UK society, and the increasing reliance on digital technologies to prove status. For EU citizens with leave to remain, "digital only status" has inscribed a "new means of control" that has reported "technical glitches" (Jablonowski, 2023a, p. 2). A feature that underpins the ability for the Home Office to enforce immigration checks throughout UK society is data sharing between governmental agencies. Data sharing between agencies has negatively impacted individuals' lives.

The story of a Tapiwa Matukutire who was a victim of a false "tip-off" from the DVLA resulted in him being arrested in his house under fraudulent charges (Dugan, 2018). The Buzzfeed article includes an audio recording of an emotionally distressed father whose status rights were stripped through the mediation of different infrastructures, data and practices being shared. What is at stake is not a newly emerging racialised border; this relationship has existed since the introduction of sovereignty and boundaries of nation-states; it is the invisibilisation and efficiency of how these processes are being conducted. Matukutire recalls the incident leaving him in shock and feeling dehumanised**.** Infrastructure becomes visible when there is a glitch, and infrastructure becomes violent when invisibilised. The process of faulty data sharing led to not only Matukutire being recategorized as "illegal" but "10% of the 167 cases that the DVLA flagged" were inaccurate (Dugan, 2018). Stories like Matukutire clarify what is at stake with the introduction of digital tools like Atlas. As the border becomes ruled by automated features based solely on "demographic" information, the racialised consequences are reinforced. We see the possibilities of racialised results of data errors when we consider how the status, position and hierarchies of migrants within borders are not equal. As Chapter Two explores those who are most negatively affected by border system are historically marginalised populations (Anderson, 2013; El-Enany, 2020; Yuval-Davis, 2011) the automation and data errors of Atlas are poised to impact those who status is made to be insecure by existing border hierarchies. Bordering through

demographic data may not be new, but what it is the experimentation and hierarchisation through automation, which changes the ability of the Home Office to produce bias border decisions.

Experimentation in the space of migration, again, is not novel. Technologies are tested in refugee camps (Madianou, 2019) and legal scholars (Maxwell & Tomlinson, 2022) highlight automation testing in the UK, but what does experimentation mean for the *Digital* Hostile Environment? The Home Office's experimentation with a new automated case working system determines how the infrastructure of bordering is internalised into temporally and spatially opaque areas. Technology forms knowledge about migrants, enacts practices, and informs infrastructure that reinforces future actions. Atlas is referred to by all Home Office case workers for data on migrants; therefore, it is knowledge. But how was this knowledge created? Experimentation in systems like Atlas can be found in the contracts like "DSA - Data Products, MI and Data Feed Re-Engineering" with Capgemini (2023). In this contract, features of "testing data analytics" in a live environment, paired with protecting the delivery of "NHS surcharge" and "nationality checks", are all operating in the infrastructure of Atlas. One of the main features of Atlas is to continue working on the testing of the "POLE" system, which consists of "person, object, locations, environment" (Home Office, 2023c). Features of data testing on systems impact citizens and migrants alike with 45 million rows of data in (POLE) alone (Home Office, 2023c). As technology becomes relied on, dispersed and invisibilised into more automated process features, the political negotiations at the border leave gaps in accountability.

Technology like the Streaming Tool (Chapter Four) offers a legal portal into resisting the racialisation process digitally enforced. Experimentation with the Streaming Tool did cause unknown amounts of people to lack access to the UK for over five years. Due to the systematic way in which racialised decision-making occurred, there could be political action against it. This ability to redress and hold technologies accountable enters a foggy fallacy. Technology like the Sham Marriage Tool (Chapter Five) is technically opaque to the public and users. Atlas has countless attached automatic features enacted to assemble information into one place. How do we hold this technology accountable? How do the political negotiations and decisions that Atlas participates in begin to be understood? How do UK citizens' data flows become at risk of being misclassified? These potent questions conflate the issues of creating a *Digital* Hostile Environment. Glouftsios and Casaglia (2022) argue that the racial effects of producing a "true identity" for migrants through algorithmic means are best captured through epidermal politics. I

draw from Glouftsios and Casaglia (2022) to support the claim that "racial" stigmatisation or discrimination is "embedded in the socio-technical data infrastructure" of the border with "codes to control" (p. 3). I argue that what is at stake is more than biometrically informed racialised control, but a duplicitous feedback loop drives computational categories to dictate truth.

6.6 Conclusion:

Atlas is the final case study of digital technologies in the Home Office. What is at stake? What has Atlas revealed about the creation of a Digital Hostile Environment? The first interaction with Atlas was in 2019 when my Tier 4 visa was accepted for my Masters' programme, and again in 2021 when I started my PhD programme. My latest interaction came from an automated email from the address (atlasnotifications.notmonitored@homeoffice.gsi.gov.uk). This email reminded me of my terms and conditions as a visa holder in the UK, nudging me into place and reminding me of my status in the UK, signed off by the Goldsmiths Immigration team. A generated email from the Home Office under the header of Goldsmiths. My third interaction with Atlas confirmed my suspicion of what Atlas has introduced into the now digital hostile environment, an automated no place to hide for people here in a legalised and illegalised manner. By introducing an automated system to process the data of migrants, the Home Office has codified a means of hierarchising and certifying identity. This chapter has demonstrated how the Atlas system has been introduced and reveals the consequences of the *Digital* Hostile Environment political negotiations becoming influenced by technological systems.

Archival politics and migration governance are not new, and my theoretical framework relies on how historical oppression and practices have been rewritten and articulated into modern technologies. Atlas presents an opportunity to make the construction of infrastructure visible. I argue against infrastructure only becoming visible if there is a "glitch". I offer that the infrastructure of Atlas is crucial to bring to the surface before standardised discrimination. I provide an overview of the change from CID to Atlas to give insight into the new negotiations being automated within the new case working system. There now can be a move to draw out from these three case studies the private actors responsible for the design, maintenance and function of the tools in the *Digital* Hostile Environment.

Chapter Seven: Private Actors and the *Digital* Hostile Environment

This chapter explores the private actors contributing to the Home Office administrative technology, Streaming, Sham Marriage algorithm and Atlas. Private actors in migration governance are not new; what is new is the ability to continually add layers to the technology shaping border practices. Border technology is adapting new methods of ranking, visualising and controlling mobility. Power expressions are not "punitive" but "creative- it shapes and creates new behaviours, conducts and techniques of how one deals with others and oneself" (Guizzo, 2021, p. 63). By exploring the private actors constructing border technology within the UK, I reveal how the case studies discussed in this thesis are embedded into the Home Office digital infrastructure. Star (1999) argues engineers and designers of infrastructure leave "traces" behind that inform the function of a system. Transformative features of infrastructure include the power to categorise (Bowker & Star, 2008), make/unmake subjects (Lesutis, 2022) and control individuals (Meissner & Taylor, 2021b) and how background systems inform power relations at the border. One method to reveal how power emerges is to trace who creates the border technology. In short, making visible who is benefiting, profiting and constructing the infrastructure of the UK Home Office.

As established in Hostile Environment literature (Andrews et al., 2020; Donà, 2021; Griffiths & Yeo, 2021; Yuval-Davis et al., 2018), the proliferation of border checks in public institutions increases the number of partners active in policing the borders. What is not mentioned is how dispersing the border within the state creates economic opportunities for non-state actors. There is a gap in the current research on how back-end systems, operational systems and information communication technology impact UK migration governance. The Home Office contracts out a range of products, subscriptions and services. The economics of detention (Hiemstra & Conlon, 2017; Martin, 2021) and border surveillance (Gammeltoft-Hansen & Sørensen, 2013; Pacciardi & Berndtsson, 2022) have been explored in critical migration literature; this chapter moves to address how data and automation are elements of the economy of bordering.

This chapter examines the private elements of three case studies (Streaming Tool, Sham Marriage and Atlas) to consider the private actors involved in constructing, maintaining and upholding the *Digital* Hostile Environment. I ground this chapter first with migration literature to explore the historical connection between borders and private actors (Andersson, 2014;

Gammeltoft-Hansen & Sørensen, 2013), to contextualise the use of private contractors as not a new practice. I argue what is new about the use of private actors in the UK border is the pattern of technological failures that perpetuate sociotechnical harms. I use the Horizon Post Office scandal to demonstrate how the over-reliance on technology, a private actor and bureaucracy interact to perpetuate harms. My focus on the private actors involved in constructing border technologies crystallises how responsibility is exported away from the Home Office to the third-party actors (both the producers and the technologies themselves). The Streaming Tool and Sham Marriage Tool are examples of technologies "produced in-house" by the Home Office. Atlas, however, demonstrates the pattern of technical construction and meditations being exported to various private actors. I argue in this chapter that the formation of a *Digital* Hostile Environment is further enhanced through outsourcing and reliance on private contractors to implement technology in migration governance.

7.1 Setting the Scene:

The private actors involved in EU migration governance have considered through the lens of security (Bigo, 2014, 2022) production of illegality (Andersson, 2014) and more recently as contributors to technological systems (Glouftsios, 2018; Martin-Mazé & Perret, 2021; Valdivia et al., 2022). As previously discussed in Chapter Two the border space of the EU is one of "free internal movement" of EU citizens between the European States and the simultaneous construction of the "Fortress of Europe" (Engelbert et al., 2019) and the securitisation and reinforcement of external boundaries. Andrijasevic and Walters (2010) direct attention towards how non-state actors' roles in shaping "norms and forms" (p.984) requires more academic scrutiny, as governments are relying on various actors for the managerial process of borders. Andersson (2014) traces, using ethnographic research, how the industry of "illegalisation" of migration produces a "chain of subcontractors" that makes accountability impossible. A key contribution of Andersson (2014) is the context of extremes for the journeys of migrants and the response by the European powers to attempt to capture the movements of persons. In a divergence from earlier work on the managerial components of the migration industry (Gammeltoft-Hansen & Sørensen, 2013), Andersson (2014) contextualises how the production of "illegality is forged in concrete material encounters"; and allows for consideration of the dispersed "value chain" or how migrant illegality is processed "packaged," presented and ultimately rendered profitable (42). I build on Andersson's (2014) claim that by exporting

features of border governance to non-state actors there is a reinforcement of hierarchies of mobility (Tazzioli, 2023) and profit extracted from the production of illegal modes of mobility (Bosworth & Zedner, 2022; Martin, 2021). I draw on Mezzadra and Neilson (2013) to trace how private actors enable "non-democratic decision in the name of efficiency" (p. 92). As my empirical focus is on the administrative modes of migration governance, I rely on critical border literature to consider the relationship between private actors and the maintenance of managerial tools.

The process of abstracting, producing and maintaining narratives of risks has been considered in the EU context in relation to private actors (Amoore, 2013; Ceyhan, 2008; Stachowitsch & Sachseder, 2019). A crucial enabler for the simultaneous free movement of people and the militarised external borders in the EU is the data-sharing between EU States and third-party actors, like Frontex, the European Union agency "responsible for integrated border management" (Kalkman, 2021, p. 165). In Chapter Two, I cover how the Schengen Information System (SIS II) has been critiqued by Bellanova and Glouftsios (2022) as prompting fragility through digital border practices. Bigo (2022) uses a security framework to think about the way politics is displaced into "bureaucratic networks and private corporate interests" and traces the historical practice of using private actors in deterritorializing the border and maintaining the narrative of the necessity of technology (p. 234). Bigo (2022) problematises the connection between technology and private actors by foregrounding the narrative of the "banopticon" to frame the process of "othering of minorities and normalisation of majorities that (in)security professionals implement" (p. 232). Banopticon, a term used by Bigo (2008, 2006), reinterprets Foucault's "panopticon" theory of how the surveillance mechanism disciplines citizens into productive and efficient members to consider how modes of surveillance do not affect all persons equally. Banopticon, as a concept, considers how "security professionals" intersect with the "white neo-colonial project" of maintaining different degrees of security for groups(Bigo & Tsoukala, 2008, p. 11). Leese (2016) contends that at the intersection of private actors and border technologies, the former have contributed to the process of 'othering'.

The relationship between private actors, migration governance and technology has begun to consider the design features of tools. Martin-Mazé and Perret (2021) critique Bigo (2014) for the lack of focus on the political economy of border technology. Crucially, Martin-Mazé and Perret (2021) prove that to understand the shape and form of the border we must consider "the

actors who are in the business of designing those bordering devices" (p. 298). Data visualisation is a common methodological practice for Martin-Mazé and Perret (2021) and Valdivia colleagues (2022) to highlight the sociotechnical power relations operating in the blurred space of private and public border actors. Baird (2016) uses network analysis to question how modes of technopolitics emerged from the use of private actors responsible for constructing the EU border regime. Technopolitics is a helpful term to trace how politics are "technically and materially mediated" (Sontowski, 2018, p. 2735) and to see that the outcomes of the combination of technology and politics go beyond the initial investigation of systems, actors and bureaucracies (Dijstelbloem, 2021). Beyond the EU context, Villa-Nicholas (2023) argues the proliferation of Silicon Valley companies at the US-Mexico border reinforces a "military-industrial startup complex" (p.139). Villa-Nicholas (2023) and Valdivia and colleagues (2022) share a data feminist (D'Ignazio & Klein, 2020) framework to prove the ethos of private actors is incompatible with ideals of equity and fairness at the border. I build on the methodology of mapping and data feminism to trace the dispersed actors present for the case study of Atlas. The data feminist principle informing this chapter is to "make labor visible " and to examine how the producers of the technology affect the outcomes and construction of technology. My consideration of private actors present in the UK is in dialogue with existing literature on the Hostile Environment.

As previously established, the Hostile Environment is the dispersed series of policies aiming to internalise border control throughout the UK public sector. Using the case study of immigration detention centres, Ibrahim (2021) argues that the inclusion of private actors expands the apparatus of migration control and hostility. Non-academic reports have emerged to consider (Corporate Watch, 2018; Mijente et al., 2018; Privacy International, 2021) the proliferation of private actors responsible for constructing border technology. In this chapter, I bring together the academic methodology of mapping private actors with the non-academic literature to connect how border technology production is non-linear. I emphasise that there are efforts in the public sphere to resist the use of privately sourced technology, primarily in the sector of asylum seekers (Privacy International, 2022). I contribute a new empirical synthesis of how private actors can be hidden within the bureaucratic structures of the Home Office, and dispersed through a singular project, like Atlas. I now consider the debates in the context of the UK government and private actors.

7.1.1 UK Government and Private Actors

At the time of writing (Spring 2024), a story in the UK headlines is the "Horizon Saga" (Peachey, 2021). Horizon, is the name of the system used in the postmaster general's office that, due to a glitch in the computer system and mismanagement of Fujitsu, systematically flagged individuals as being in debt to the Post Office (Foley & Booth, 2020). Post Office workers' financial discrepancies were due to a computer glitch from a system built, constructed and managed by the company Fujitsu. For 14 years and over 700 lives upended from the Post Office prosecuting countless sub-postmasters due to financial discrepancies, signalled by a computer system. Now considered to be the "worst miscarriages of justice in British history" (Business and Trade Committee, 2024), the practice of the Post Office valuing the results of a privately produced technology over the accounts of their employees demonstrates the risks to technosolutionism.

Christie (2020) reveals that the Post Office and Fujitsu "named bugs using the branch where they had first occurred. Two of the most significant were the Dalmellington Bug, discovered at a branch in Ayrshire, and the Callendar Square Bug, also from a Scottish branch, in Falkirk. This naming habit linked bugs to users, not the system" (p. 51). Awareness by the Post Office that the Horizon system had significant technical failures was ignored and the victims of the scandal were prosecuted for a theft they did not commit. There has been evidence that Fujitsu had remote access to Post Office sub-postmasters' internal systems; the employees of Fujitsu could alter and audit the systems without the knowledge of the users (Christie, 2020, p. 58). I use the example of the Post Office Scandal to demonstrate that the patterns of the Home Office on privately developed, maintained, and designed technology systems are strikingly similar to those of the Post Office. They are both government agencies relying on faulty technological systems. The Post Office Scandal offers the socio-political impact of technological glitches. As we explored in Chapter Six, Atlas has recently been reported to have data failures, glitches and mismanagement of information that has resulted in migrants unable to prove their status in the UK (Taylor & Dyer, 2024). Lessons learned from scandals such as these, resulting in hundreds of individuals stripped of their rights in both a systematic and invisible way, have been cropping up in UK life. While the Post Office scandal and the Windrush Scandal affected different constituencies, lessons must be learned. These incidents inspire my work to try and make infrastructure visible before there is a "glitch".

Glitches involving public governance technology can be harmful to populations as the outcomes of technologies continue to be valued over individual testimonies. Benjamin (2020) argues "glitches" show not failure, but the fundamental values of a system. One interpretation of the Post Office is that the failures derived from one bad system or that this was simply a bad apple. I pursue a different argument: the infrastructure of the Post Office and UK migration has been built on these expensive, technically flawed and overbearing systems. As Benjamin (2020) wrote, individuals often view "glitches in an otherwise benign system. By contrast, sociologists have worked to delineate how seemingly neutral policies and norms can poison the entire "orchard" or structure of society" (p. 80). By framing glitches through Benjamin (2020), I consider how the technological outcomes and failures of the systems are not erratic eruptions, nor unforeseen occurrence, but are informed by a series of benign norms. Some of the norms I emphasise as contributors to the normalisation of glitches include the reliance on private actors by government agencies. I argue that one aspect of bordering not considered in the UK context is which actors are benefiting, collaborating and dominating in the space of border technology. Crucially, how can there be interrogations into the private actors to break open what knowledge is being produced for the future border infrastructure?

To stay on the Fujitsu example, the technology that the Home Office has used for 29 years to create the "watch list of passengers", called the "Warning Index", is a Fujitsu system (Comptroller and Auditor General, 2020). Currently the Home Office is attempting to redesign the watchlist system, to end the reliance on Fujitsu, but has repeatedly been unable to launch a new system. Another reason the Home Office attempted to remove the watchlist system and create new data storage options is "data for the Warnings Index is held by Fujitsu in its data centres" (Comptroller and Auditor General, 2020), p. 22). As of 2022 the Home Office has extended the contract with Fujitsu until 2023; there is no current report on whether a replacement system and data solution has been reached. Reports from the National Audit Office (NAO) reveal the pattern of the Home Office failing to deliver technological projects on time, within an agreed upon budget and without technical glitches. I have previously explored, in past chapters, how technology is the Home Office's proposed solution for creating more efficient, equitable and economically beneficial migration governance. I now explore the pattern of the technological projects of the Home Office creating a "political lock in" (Boswell & Besse, 2023). Reliance on private actors to build the "e-border" system has been described by Boswell and

Besse (2023) as a “political lock in: situation in which technology hype twinned with security rhetoric creates an incontrovertible political logic, making a project difficult to abandon, despite its manifest failings" (p. 2). I combine Boswell and Besse (2023) with Martin (2021) to frame the continual outsourcing of technology projects to private actors as a broader pattern of profiting from the production of illegitimate mobility.

Martin (2021) argues that the privatisation of migration governance has led to the emergence of a specific type of value extracted from migrants: status value. Defined through the Marxist theory of the extraction of value and inspired by racial capitalist literature, Martin (2021) suggests that migrant life is now made to be “valuable”. Martin (2021) examines the dispersal of sovereign power into “everyday practice”" from this theory; she argues that private actors have informed these governing practices. Privatisation of the carceral economy engages with previous work on producing the illegality of certain migrants and the importance of categorical power within migration governance. Martin (2021) argues that it is through the lens of carceral economies that migration control contributes and draws from “racialised, gendered postcolonial geographies of precarious life” (p. 753). My engagement with Martin (2021) is to foreground the discussion of private actors contextually, historically and socio-politically with previous discussions of how racialised and gendered power dynamics emerge at the intersections of borders and technology. Martin (2021) proves that one cannot separate the capital gains from private actors contributing to border enforcement from the racialised and gender conceptions of borders. My research has limitations regarding access to information and providing categorical proof of technologically mediated discrimination. To overcome these research limitations, I seek to break open the technological infrastructure to reveal patterns of categorisation, experimentation and automation and to expose the perpetuation of a *Digital* Hostile Environment. Glouftsios (2021) describes technological systems produced by multiple actors as “heterogeneous engineering” (p. 17) and focuses on the design of border technology. I draw on Glouftsios’ (2021) focus on the maintenance, construction and adaptability of border technologies when interpreting contracts between the Home Office and private actors. From the overview on how private actors are considered by critical border and data scholars, I turn to discussing the themes of how private actors emerge in each case study.

7.2 Discussion: Private Actors of Case Studies

To begin the discussion on the private actors contributing to border technology, we will return first to the Streaming Tool. The three themes that emerge from examining private actors is the risk of: (1) facilitating the adaptability of technologies, (2) accountability and (3) reliance. Before I go into detail on how private actors emerge in each case study, I give a broad overview of how each tool fits into each theme.

The first theme in the use of private actors in administrative border technologies is the facilitation of adaptability of tools. This theme emerges in all three of the case studies. In the case of the Streaming Tool, I examine how the use of plug in products, a Microsoft's database service, facilitates the increasing automated features of the replacement visa risk assessment algorithm. Involvement of private actors like Microsoft, Google and Amazon have been described as "platforms" (Aradau & Blanke, 2022). Use of privately produced software to operate government systems are described as "plug in" (J. Tomlinson, personal communication, 24 February 2022). What is crucial for the discussion on adaptability of technology, facilitated through the privately sourced software, is the degree to which automation can be transferred. My point is not to suggest that the Home Office label of "in-house" must be stripped if there is the use of plug in software; instead, I wish to direct attention to how the provision of database options facilitate the ability of technologies to adapt and develop. I first explore the adaptability of database platforms in the consideration of the Streaming Tool, and I then connect this to a larger discussion on cloud storage and Atlas.

Adaptability of the technological systems must be considered within the context of the political challenges that the Home Office has faced with their use of the automated system, primarily with the design of the Streaming Tool. I begin with the discussion of adaptability as this is an overarching theme of all the case studies and the use of private components. For by deconstructing the insistence that Home Office tools, like the Streaming Tool and Sham Marriage, are produced and maintained by governmental agencies, the theme of accountability emerges. The theme of border technologies being able to be technically redesigned to incorporate new political or legal contentions, to maintain the same exclusionary logics under a new model, introduces how accountability is outsourced to private actors.

Accountability as an emerging theme is prominent in the latter two case studies, Sham Marriage and Atlas. We begin to see in the Sham Marriage algorithm that the subsection of the

Home Office responsible for constructing the tool employs primarily private contractors. By questioning how the Home Office department of (DSA) uses experimental methods to adapt the digital tools we begin to untangle how baked into the production and use of the technologies poses questions to accountability. In Chapter Four, there is a socio-technical deconstruction of how the known data inputs for the risk assessment of marriage applications tend to reinforce social bias. The discussion of how the data inputs have been experimentally adapted by a mixture of privately contracted data scientists, whilst being maintained as an 'in house' technology deepens the critique of the Sham Marriage tool. I explore the issues of accountability arising from the production of border tools. The theme of adaptation and accountability issues have been covered, the final case study, Atlas, is an exemplar of the final pattern of built in reliance on technologies.

The discussion of Atlas builds on how, as the infrastructure of the Home Office becomes increasingly automated and produced by private actors, there needs to be a question of how departments are relying on contractors. I build off how Atlas as an ongoing technological programme provides an opportunity to question how the discriminatory outcomes, like those in the Streaming and Sham Marriage tool, may be built into a system through a mixture of bureaucratic ignorance Boswell and Badenhoop (2021) and techno-solutionism. By mapping the various actors, networks and components of Atlas that are outsourced to private contractors there can be a visual representation of how adaptability and accountability are technically dispersed in the design of the caseworking system. Based on the publicly available information on the private actors involved with Atlas, the final theme of reliance can be explored. Based on contractual analysis, the reliance of Atlas on private actors emerges when there is a technical issue, as this is outsourced to a private contractor to solve. This theme overlaps with questions of accountability, but the ongoing project sets up the final discussion on how the private solution of cloud computing is facilitating the ability of the Home Office to collect vast amounts of information on individuals. My final consideration on the investment in cloud computing summarises how the technical capabilities to share, store and analyse data informs the creation of a blurred and Möbius border. From this discussion on the three themes that emerge from the consideration of how private actors contribute to the function of the case studies, I begin with the use of privately produced software, by Microsoft, in the network of the Streaming Tool.

7.3 Streaming Tool: United Kingdom Visa and Immigration and product-based

In Chapter Four, the Streaming Tool, I argue that we must see algorithms through the infrastructural lens. I then show how the seemingly surface-level "risk assessing algorithm" is based on an extensive underlying web of systems. Amaro (2022) argues that with algorithmic power to reinforce "existing racialised human dynamics", accountability is shifted to the algorithm, inviting more capital-driven techno-fixes (p. 22). Technology and capital gains have been examined through the scope of surveillance logics (Gandy, 2021; Zuboff, 2020) and emphasise the financial motivations for collecting vast amounts of personal data. The Home Office's replacement of the Streaming Tool with an algorithm works in a slightly different manner - it does not use nationality as a direct input-but reveals the enduring reliance on supporting software. Software is here defined, as in the Streaming Tool Chapter, as plug-in tools that support the function of an algorithm. The Streaming Tool did not exist in isolation; it was part of a diverse network of software, socially derived data and databases. A limitation to understanding the labour negotiations associated with the Streaming Tool result from the insistence, by the Home Office, the algorithm was produced "in house"(Home Office, 2021d). I argue that the Streaming Tool's continual reliance on private actors to provide software, primarily Microsoft, reveals how the legacies of the system remain in the infrastructure of digital services.

The Home Office articulated the labour and production of the Streaming Tool. In response to the query on whether any "third parties" were present in the processing, automating and analysing, of the Streaming Tool, the Home Office responded that the tool was "created and developed in-house at the UKVI" and that:

> While there will have been a build cost in terms of developer time spent on the project, this cannot be easily defined. Full time equivalent (FTE) resources are provided from the existing headcount and utilise staff that have specific IT skills. Maintenance and ongoing support of the Streaming Tool equates to approximately 50% of an Executive Officer (EO) and 25% of a Senior Executive Officer (SEO) (Home Office, 2021d).

Not articulated in the Home Office's declaration of third parties is the reliance of the Streaming Tool and its replacement system, CARS, on other platforms. CARS, the replacement for the Streaming Tool (J. Harvey, personal communication, 24 March 2022). Legacies from the Streaming Tool are present in the supporting software for the replacement technology. The Proviso system, the out of country database for visa applications rests on "MS SQL" database

(Home Office, 2014). MS SQL is a database management software using the programming language "SQL", meaning, Structure Query language, primarily used to communicate with databases in searching and managing databases. Supporting the CARS system is the Microsoft product "MS Access" (1).[16]

The ICIBI reports (2023) that the rollout of CARs is supported by the "new Microsoft Access Database, which added a degree of automation to determine the complexity of the application. This tool uses a look-up function to identify pertinent application data from the Proviso system to assess certain attributes against a series of indicators of application complexity" (p. 8). As previously discussed, automation in the UK digital infrastructure is being technically obfuscated. MS Access is a database management system and is a method of storing and making data usable. Technical opacity is introduced with the reliance on a Microsoft's system. [17]As Kitchin (2021) suggests, database design is not predetermined. The embedded nature of Microsoft's database service facilitates how the Streaming Tool technically is poised to be redesigned to incorporate more automated features. Identifying how the connections of the Streaming Tool can be linked to the changing policies around international data sharing, particularly between the UK and the USA, sheds light on the ability of technology to introduce the risk of function creep[18] in digital systems.

7.3.1 Microsoft and the CLOUD Act

UKVI developers built the technology, but this does not necessarily mean that this is the only technology used to rank and filter visa applications. I found on ContractFinder.com 15 contracts for the Home Office, ranging from 2017 to 2022, hiring Microsoft to provide back-end services. As of 2021, the UK Crown Commercial Office signed a Memorandum of Understanding (MoU) with Microsoft to provide cloud services for all public service bodies

[16] MS SQL is a database server, a feature provided under the umbrella service of Azure. Microsoft describes "MS SQL" as "part of the Azure SQL family" Azure SQL Database is an intelligent, scalable, relational database service built for the cloud. Optimize performance and durability with automated, AI-powered features"(Microsoft, 2019).
[17] Under the Azure service, a database, like Proviso, can use "machine learning services and analysis services" ; there are some SQL services that are localised, not in a cloud system; however, the exact subscription being used by the Home Office is unclear. Kitchin (2021) describes cloud database structures as congruent with other "machine learning" functions like data analytics, visualisations, and predictions (Kitchin, 2017, p. 201). A deeper appreciation for the impact of the infrastructural nature of the Streaming Tool and the traces it has left behind is discussed in Chapter 3 (Microsoft, 2019).
[18] Function creep refers to the ability for technology to be used for one capacity and then reused in a different context. For further literature on function creep see here (Koops, 2021; O'Neil, 2016; Pereira & Raetzsch, 2022).

(Microsoft, 2021). The Streaming Tool and the UKVI service show how the relations of technology used in the infrastructure of the Home Office is dynamic and fluid. Microsoft describes the provision of their services as supporting a "cloud-first policy" and "one Government, One cloud" (Donnelly, 2021). Gareth Rhys Williams, the government's chief commercial officer added, "this new agreement with Microsoft builds on the Government's One Government Cloud Strategy, which supports the key principle of treating government as one customer" (Donnelly, 2021).

Another layer of technical opaqueness is that the Home Office hires Trustmarque Solutions Limited to supply Microsoft products like "Azure cloud" (Home Office, 2019b). The third-party Trustmarque Solutions are behind the features of the products used by the Home Office. Whilst the Streaming Tool was produced in-house only through an application of an infrastructural lens, can there be a socio-technical re-engagement with the various actors contributing to the production of the bordering technologies? While the Streaming Tool may have been designed by Home Office employees, it is supported by software whose provenance is external to the department. The development of the data sharing between the UK and the US under the new bilateral treaty links the use of Microsoft, a US based company, to larger networks of power.

Connections to the United States are facilitated two-fold by Proviso: the use of an American Company, Microsoft, and the new geopolitical construction of the data sharing treaty. The new legal treaty between the UK and the US, the Clarifying Lawful Overseas Use of Data (CLOUD Act), gives law enforcement agencies access to data held by US technology companies (Lostri, 2020). The CLOUD Act allows the UK to request data from a US based company, even if the data is not stored on American territory (Rozenshtein, 2023). Publicly available data or visibility into how the US and the UK are using the Cloud Act is sparse. "US companies can comply with requests for communications metadata: that is the "who, where, when and how" of the communication. (*Written Testimony*, 2017). According to McGuinnes (2017), United Kingdom Deputy National Security Adviser, often the "what of data", for example the content of email and instant messages, "is the vital information that can help stop violence and bring a criminal to justice" (p.3). The Cloud Act is a new legal tool for the UK government to request access to data held by private actors, like Microsoft. I mention the Cloud Act to reinforce the idea that the networks, relations and power of data sharing are fluid. Just as software provided by

private actors is adaptable, the access that states may have to privately stored information is subject to change. This new exchange of cross-border data sharing complicates the network of the Streaming Tool, as it opens the data being stored on Microsoft's platforms to law enforcement in the US and the UK. The CLOUD Act between the UK and the USA is presented as a means to "prevent, detect, investigate and prosecute serious crime, including terrorism, transnational organised crime, and child exploitation, among others" (Hunton Andrews Kurth LLP, 2022). The CLOUD Act overrides GDPR protections, as the data shared between the UK and the US is under "criminal" data (Ibraimova, 2022). Cloud computing is discussed in more depth later in this chapter. We move now to consider how private actors' contributions to border technology is technically opaque, as subsections of the Home Office comprise a high percentage of private contractors.

7.4 Sham Marriage: Is it public, private, or DSA?

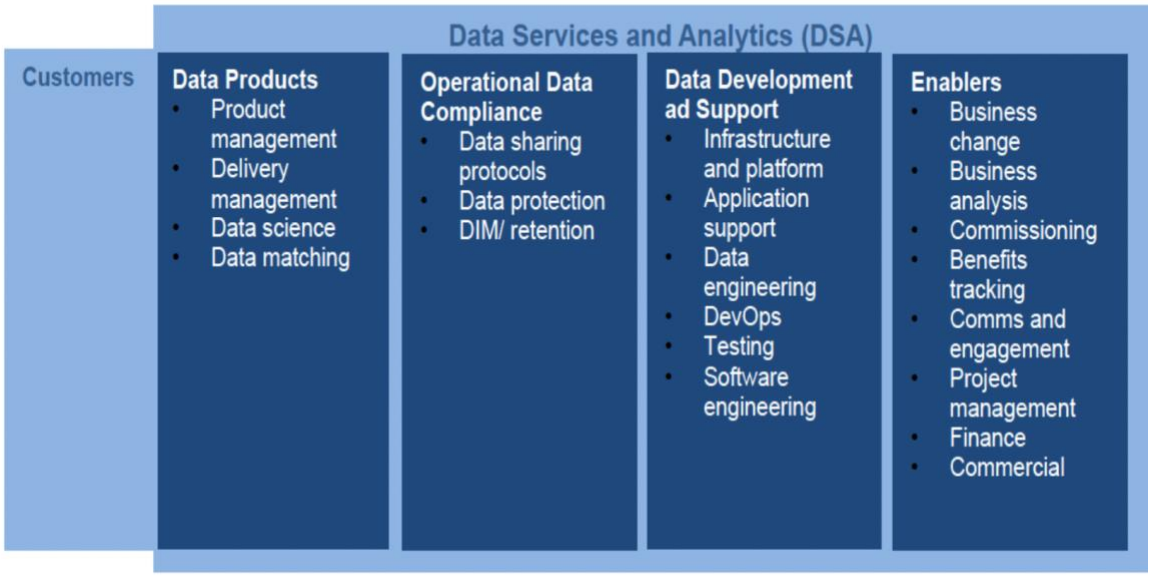
As the Sham Marriage chapter revealed, the Data Science and Analytics (DSA) designed the algorithm that assessed couples based on eight factors. How the DSA operates and is structured is technically opaque. I use a mixture of desk research and FOI requests to uncover the involvement of private actors in the Sham Marriage Tool.

An FOI request reveals that the "automated system utilises an assurance scoring tool built by the Data Science and Analytics" (Home Office, 2021e). The DSA may have built the Sham Marriage algorithm, but the tool is managed by the Data Analytics Competency Centre (DACC). The same Sham Marriage FOI reveals that the DACC runs the "daily reports" that determine red and green-flagged cases (Home Office, 2021e). I searched public job postings to uncover the connections between DSA and DACC. The DACC describes itself, in a job posting, as "a data-centric team that supports ETL (Extract, Transform and Load) functions to build and maintain services for Home Office partners" (Home Office, 2017b). Under their job posting, the DACC describes the agency as "The Home Office Data Analytics Competency Centre is one of the most advanced and well-established data analytics centres in Government. We sit at the heart of the Home Office's transformation into a data-driven department" (Home Office, 2017, p. 2). What is clear is that the DACC is part of the Home Office. What is still unknown is if this is a public entity, as the creation of this centre was up for bid in 2017, meaning the DACC was listed as a public tender that was open for private contractors to bid on. The figure below outlines the structure and responsibility of the DSA.

Figure 19: Structure of Data Science and Analytics

The existing service team is comprised of civil servants and professional support from an incumbent commercial supplier.

Figure 1 – DSA Structure



(Home Office, 2023d)

In the use of the word "customers" in the above chart, there are hints as to how the DSA has been adapted to be a hybrid department, a public department with the logics of a private sphere. To clarify the allusive nature of these two organisations, the DACC and DSA, I submitted an FOI request to the Home Office.

On the 4th of May 2023, I requested the Home Office confirm the governing body and the ratio of public servants to contractors making up the DACC. The Home Office responded:

> The DACC no longer exists as a team/unit in the Home Office. The DACC and other teams were merged into Data Services and Analytics (DSA) in 2018. The roles and responsibilities of the DACC are now carried out across this wider group which has a wide range of different responsibilities (Data Services and Analytics, 2023)

This FOI clarifies the relationship between DACC and DSA. Similarly to the Streaming Tool, tracking what labour is put into the Sham Marriage Tool is difficult. What is crucial to understand are the socio-technical impacts. From this positioning, I do not offer a concrete cost of the Sham Marriage, but I suggest the black box of the economic cost of technology points to a larger pattern of offshoring departments from public servants to private actors. By showing how there is a black box obscuring the private actors present in the construction of the Sham Marriage Tool, the discussion from Chapter Five on the technical opacity of the algorithm is deepened. Indeed we can further challenge the figure of the 'black box' (Pasquale, 2016) by viewing the opaqueness of the institutions and private actors that contribute to the Sham Marriage Tool. Adelmant and Tomlinson explain (2022):

> Even in instances where more of the design and development occurs in-house, agile invites other forms of influence from technology companies. Rather than government instructing an IT company on what to build, agile approaches often entail the intertwining of consultants into government, as contracted-in specialists sit in government offices full-time,working alongside civil servants in hybrid teams. Such instances might therefore be better described as "insourcing" rather than "outsourcing" (p. 8).

Adelmant and Tomlinson's (2022) description of the pattern of "in-house" consultants depicts how the private actors are embedded into the fabric of government technologies.

Once I confirmed that the DACC was absorbed into the DSA, my attention turned to identifying the ratio of private contractors to public servants operating in the DSA. The Home Office confirmed (May 22, 2023) that the "total resource designated as Civil Servants: 168 and the Total resource designated as Contractors: 686" with a total of 854 employees (Data Services and Analytics, 2023). As of May 2023, the DSA is comprised of 80 per cent of private contractors in the entire workforce, with only 20 per cent civil servants. The large proportion of contractors blurs the boundary between private and public. DSA operates under the umbrella department of the Home Office with the authority of a public sector producer and technology provider. There is a pattern of Home Office's digital teams maintaining a large percentage of private contractors. The NAO reported:

> As part of the reset, the Department increased its Digital, Data and Technology function staff working on technical aspects of the programme such as testing and support. To reduce programme running costs, it sought to reduce its reliance on contractors, stood at more than 80% of staff delivering the programme in May 2019. By May 2020, it had reduced this to 64%, but by September 2020, it had increased again to 78%. The Department is now

> confident that it has the technical capability and resources it needs to deliver the programme" (Comptroller and Auditor General, 2020)

NAO's report demonstrates the continuations, and inability, of the Home Office to decrease their reliance on private actors. As the pattern of the Home Office having a high percentage of contractors has been established by NAO, what is unknown are the specific actors and technologies the private companies are responsible for designing or implementing.

The introduction of private actors in government processes, like decision-making and case management, introduce notions of market efficiency (Chacón, 2022). Market values, efficiency or cost-effectiveness, have been critiqued as reinforcing a racialised capitalist structure via the private actors responsible for immigration decisions, whilst increasing opacity of government procedures (Gottschalk, 2016; Hiemstra & Conlon, 2017). Debates on the impact of privatising detention (Martin, 2021), surveillance (Bigo, 2022) and policing (Aliverti, 2014) of migration inform how I frame the opaque team that created the Sham Marriage Tool. I build on the principle that as private actors for profit in the space of migration governance, the development and continuation of state contracts becomes a tactical business avenue. As the consultants and technical experts are brought in to help 'fix' (Robinson, 2018), there is a transformation of the tactics and tools deployed at the border (Zedner, 2022). Lori and Schilde (2021) argue that migration outcomes need to consider both the "state imperatives and private actors" (p. 2). I build on Lori and Schilde (2021) to contextualise that the insourcing, blurring and contribution of private actors within migration governance is a "new tool of state control" (p. 3). Unknown in the context of the Sham Marriage team is the exact work, if any, the contractors contributed to the algorithm. The discussion of how DSA infrastructurally operates in the blurred space of private and public projects exemplifies the exporting of design and responsibility to various private actors. What can be seen is the influence of market values, like experimentation, into the infrastructure of the DSA.

7.4.1 Experimentation in the Data Science and Analytics

Data Analytics and Competency Centre (DACC), now called the DSA, exemplifies how private actors values of efficiency, experimentation and optimization are imported into the delivery of public services. An example of the transfer of market logics into the operations of the Home Office is the practice of experimentation with automated systems. Rupert Chaplin (2018),

then Head of Data Science at the Home Office, gave a presentation to the Open Research Society on June 28th of 2018 entitled "Data Science and the Home Office." In the presentation, Chaplin provides examples of how data science is transforming the practices of the Home Office. Chaplin (2018) was part of the Data Analytics Competency Centre, a "lab" built to support Home Office operations. The DACC is described as a workforce within the Home Office that operates as a "largely business driven and working on commission basis and creates space for innovation, to build products we can sell to customers in the future" for the projects needed by the Home Office" (Chaplin, 2018). Language like "business driven", "innovation" and "customers" exemplify how the DACC is influenced by private logics. To consider how the influence of market values on the sub-section of the Home Office Dijstelbloem's (2021) framing of "infrastructural compromises" is essential to tracing how borders develop in parallel to data analytics (p. 34). What becomes clear is that as the department developing the data analytic tools prioritises the knowledge and 'expertise' of digital technology, and is led by the knowledge produced by tools. DACC is a clear example of the blurring of the public/private boundary; a governmental body that is "out for hire" for the Home Office and employs a majority of private contractors.

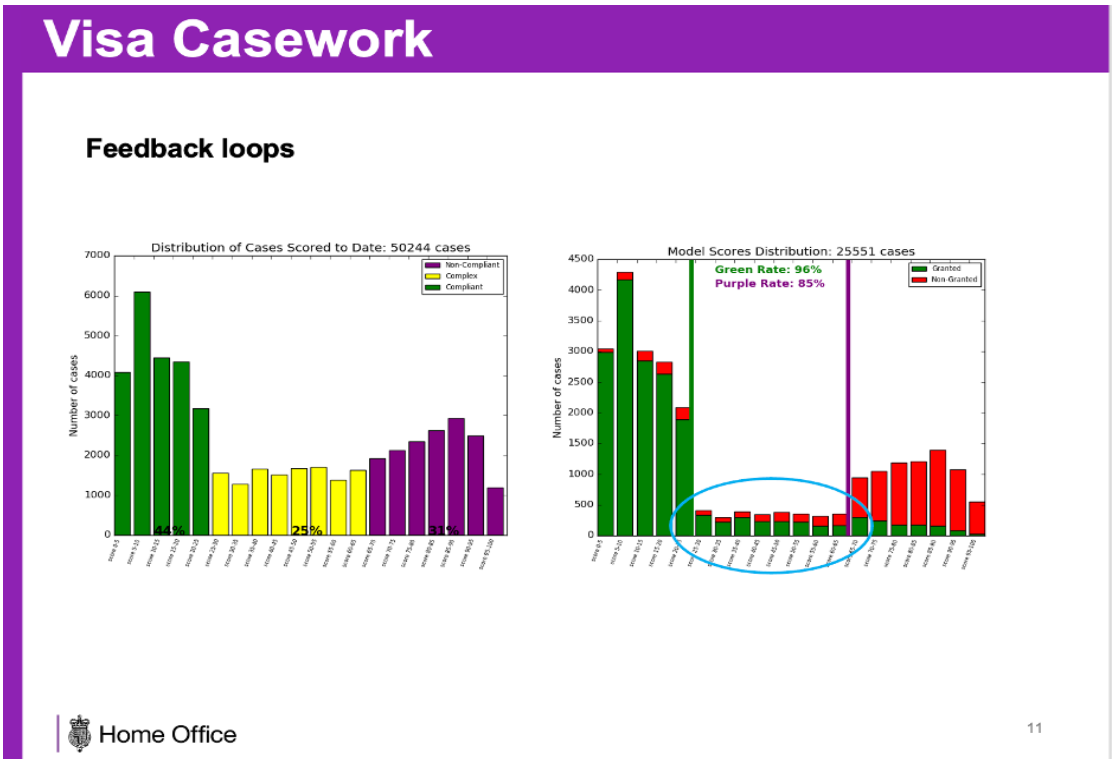
The reporting structure, as Chaplin (2018) describes, for the DSA "sits between" the Home Office "analytics" operations and the Digital, Data and Technology team. He provided a detailed overview of how the DSA conducts searches for individuals across all the databases, using IBM Infosphere, is used across all the datasets to create a probabilistic match of individuals' data. The sixth slide covers the number of false positives allowed to be maintained. Chaplin suggests that more false positives are allowed if humans are involved further down the line, in the decision-making procedure. What is not discussed in the duration of the video is the other "users" of this system, migrants. During the presentation, Chaplin (2018) used the example of the visa case working system created to reduce the backlog of family reunion visas. This technology used a colour-based risk rating algorithm[19] to help the Home Office caseworkers digitalise their operations. While summarising the use of "machine learning", Chaplin (2018) asserts that the method the DSA takes in building algorithms to "predict the outcomes of future decisions" is based on historical data. The approach, as described by Chaplin (2018), is about the

[19] This sounds familiar to the Streaming Tool algorithm; I cannot confirm if this was indeed the system Chaplin was discussing in the presentation.

“data scientists getting the data into the right form and selecting the right algorithms that can learn from the data and come up with a predictive model”. The process Chaplin (2018) describes means that the variables that are chosen to determine risk assessments are not chosen by caseworkers but produced by a series of different algorithms. Chaplin’s (2018) description of the DSA demonstrates how decisions are transferred from the “sovereign to the programmers” (Johnson et al., 2011) when determining which individuals are rendered more visible at the border. Chaplin's (2018) talk clarifies how the Home Office’s digital team believes technology, and experimentation, “improves” migration governance.

Chaplin (2018) claims that the DSA works to combat confirmation bias by intervening in using “historical data”. The DSA team seeks to stop bias arising, or, as Chaplin (2018) states, “the dog eating his tail,” by designing the system randomly to switch cases that were rated “green” into the red category and vice versa. Chaplin (2018) describes a “random switching” of the labels of risk; this means a green rated case would be allocated to the red streamed case workers and vice versa. There was no reflection on the impact of a visa case that may be randomly switched into a group with higher scrutiny levels. While sentiments on wishing to mitigate confirmation bias are promising, what is troublesome are the real effects this may have on an immigration decision. Below is a chart from Chaplin’s (2018) presentation that shows the scale of refusal of visa decisions graphed out in red, amber and green.

Figure 20: Presentation from Data Science and Analytics



Chaplin (2018) points out that the graph shows that the case working team does not process the amber cases; the primary issue flagged in the presentation was the "need of the outcomes" for the model and then second only the individuals. Chaplin (2018) prioritised the need for a better, more predictive technology above considering the socio-political space that the technology is operating in, the practices of borders. For a case that is perceived as red risk, as demonstrated in Chapter Three, has a higher rate of rejection.

Legal scholars Maxwell and Tomlinson (2022) used three case studies to demonstrate how the Home Office experiments with automated systems and how redress becomes difficult when technologies intersect with decision-making mechanisms. This legal perspective on experimentation shows that the introduction of systems into the live environment is a risky form of experimentation. Chaplin (2018) explains the drive to experiment as the rationale to continue to improve the technology, and it was not until much later that the stakes of migration were considered. By examining the blurring of the private and the public under the DSA structure, we see this organisation as a linchpin to UK public governance as it creates products used in other departments. By revealing the DSA structure, as a public sector with a high percentage of private contractors, the label of the Sham Marriage produced "in-house" is deconstructed. The theme of

adaptability and accountability are crystallised through the examination of the DACC/DSA's practices.

The design and structure of the DACC to let the algorithms lead and to experiment with the random allocation of visa cases to different levels of risk evidences the emerging pattern of the difficulty to identify accountability of border technologies. Proliferation of private actors in border technologies is rising as the Home Office attempts to reconstruct legacy programmes. The DSA currently has a 55 million pound contract with Capgemini and a 45 million pound contract with PA Consultancy (Say, 2022). Some of the duties expected from the contractors are a "roadmap" of new technologies, "data quality assurance" of the central database, and to "undertake the programme's … risk management aspects" (p. 25). We cannot say what role Capgemini has in the contribution to the Sham Marriage tool directly, but from the unearthing of the embeddedness of private actors in the DSA there is the clarification of how the label of "in house" has transformed into the pattern of "insourcing" (Adelmant & Tomlinson, 2022). From the deconstruction of the 'in-house' technologies of the Streaming and Sham Marriage algorithm, the themes of adaptability and accountability emerge. From these themes, there can now be an examination of Atlas that clarifies the pattern of reliance from the Home Office on private actors.

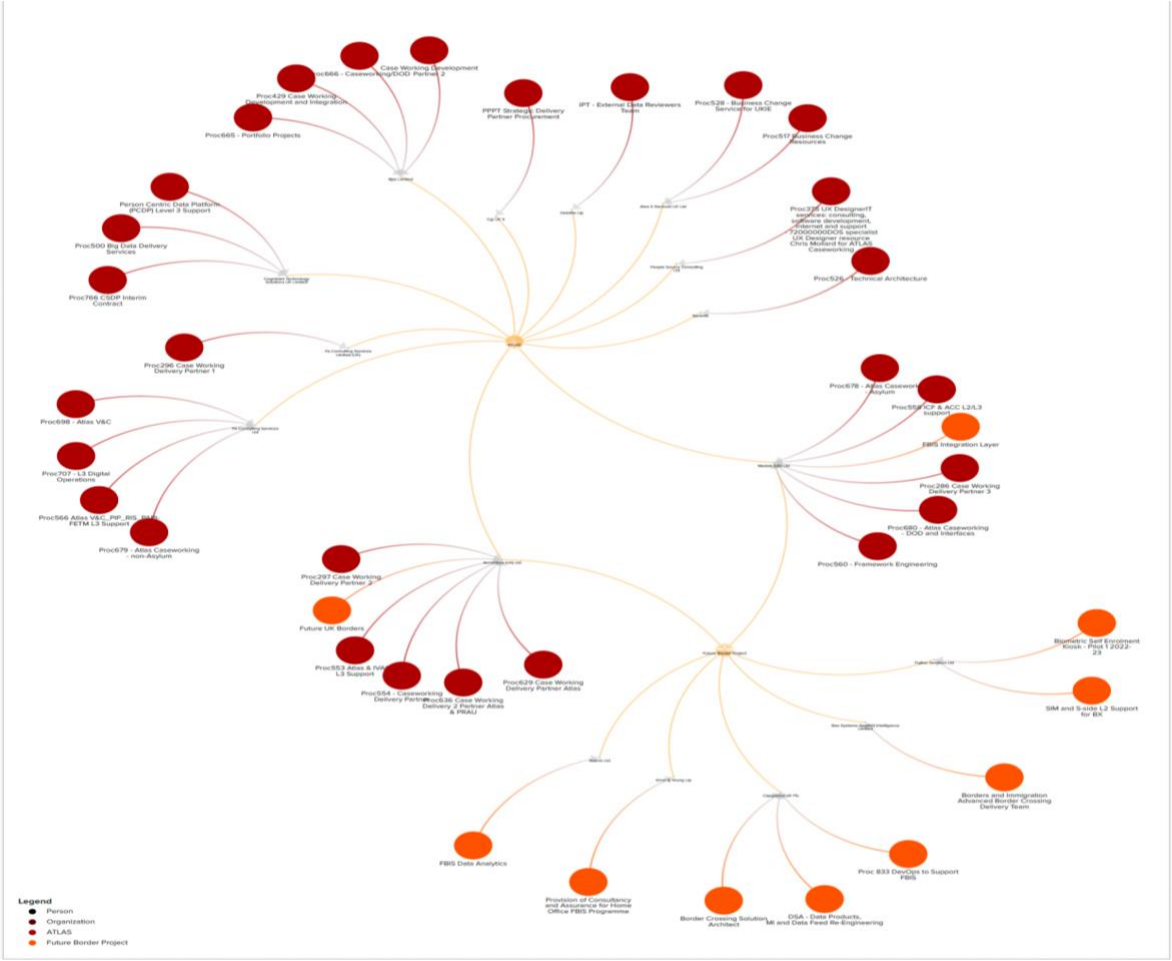
7.5 Atlas: The Proliferation of Private Consultancy Firms

Atlas exemplifies the pattern of outsourcing the design, construction and maintenance of border technologies to private actors. Atlas differs from the Streaming Tool and Sham Marriage algorithm as there is no claim, by the Home Office, that the system was built in-house. Phil Booth claimed that (summarised, not a direct quote) in our interview (P. Booth, personal communication, 31 March 2022), the issue with Atlas is that it is a massive project with unclarified moving parts. Booth (2022) expressed the need to look at the entirety of a system to ensure that we are not just looking at sub-systems only when things go awry. I use Booth's (2022) rendering of Atlas as a major, fluid and complex project to argue there is a need to proactively critique the design of systems, rather than to retroactively examine the socio-political harms.

The following findings derive from 30 contracts consulted on the publicly available website "https://www.contractsfinder.service.gov.uk/Search". Limited by what is available, I proceed to review some publicly available contracts between the Home Office and contractors.

Of the 30 contracts, only 10 had a publicly available contract. These contracts were identified by various search methods, primarily using search words like “ATLAS”, “Database”, or individual company names once they were identified as a known contractor. Below is a map of the private actors present in the contracts for ATLAS, and the future borders project [20] to visualise the dispersed features of the construction of Atlas.

Figure 21:Private Actors and Atlas



The above map contains the two projects, Atlas and Future Borders. The first node of the map represents the private actor hired for the contract. The outmost node is the name of the contract.

[20] I include Future Borders in the map as there is overlap to how Atlas is considered, either in the Portfolio Project and the Future Borders portfolio. Here is a live version on the map.

From this surface level mapping of the contracts between the Home Office and private actors, I move to consider the specifics of a selected few contracts. The Home Office revealed that:

> the main suppliers are: 6Point6; Atos; Deloitte Digital; Capgemini; IBM; PA Consulting; Mastek; BJSS; Cognizant. The supplier would work within an ecosystem of suppliers, and work will be awarded depending on the capacity and capability of suppliers to perform the statements of work. A short assessment may be required where more than one supplier has the necessary capacity and capability (Home Office Immigration Technology Portfolio, 2017)

The Home Office's description of Atlas provides insight into the collaborative nature of the contractors. To recognise some of the previous work around the intersection of border and private actors in the UK, I draw on a Privacy International Report (2021) that deconstructs some of the main projects undertaken by the Home Office. This report offers an overview of the Home Office's consumption patterns in building and maintaining IT services. Privacy International (2021) offers insight into the Atlas project, also known as "Immigration Platform Technologies (IPT)" (p.19). Privacy International (2021) writes, "in 2019, it was revealed that some 98% of staff working on the programme are temporary staff; Accenture, 6Point6, Atos, Deloitte Digital, Capgemini, IBM, PA Consulting, Mastek, BJSS, and Cognizant are all listed as some of the main suppliers to the project" (p. 19).

The boundaries between state and non-state actors and how the different collaborators work on a particular technology is blurred. Accountability is harder to maintain in this complex web of knowledge and labour production. As the Home Office wrote, the contractors must deliver in "Scrum Teams" (Home Office, 2022a), a term encompassing the integration of multiple parties to deliver a project. Teams under this project management style take "ownership" of different aspects of the technical delivery. BJSS Limited, a technology consultancy firm, describes their work with the Home Office as:

> Having been involved in the build phase of Atlas – the Home Office's new immigration caseworking system – our Development team handed over to our Managed Service team who took on the management of the system's interfaces. Atlas is tightly integrated with several other systems across the Home Office, and our team plays an essential role in ensuring that data is fed into Atlas correctly. This service is highly collaborative, with the team working with numerous different suppliers to ensure the stability of Atlas (BJSS, 2022).

BJSS' assessment of Atlas as "tightly integrated" with other systems and "collaborative". Working with other suppliers describes the essential elements of Atlas. The case working system

technically is a networked device, feeding into various Home Office services, and the development of the tool draws from several dispersed private actors. The Home Office, in relation to their development of the EU Resettlement scheme, describe their strategy as "not to rely on one supplier to build the end to end solution but to bring in a number of specialist providers to create the digital, mobile, automated and integrated systems that end users expect" (Nokes, 2018, p. 145). This pattern of reliance has been framed by Boswell and Besse (2023) as a "political lock in" and that the outsourcing of technological projects to private actors is reinforced no matter the number of actors, one or many, as the "hype" of technologies' ability to deliver "infeasible projects" (p. 5). I use Boswell and Besse (2023) to problematise the outsourcing of Atlas to various private actors, for all stages of the development; the delivery and the data quality assurance.

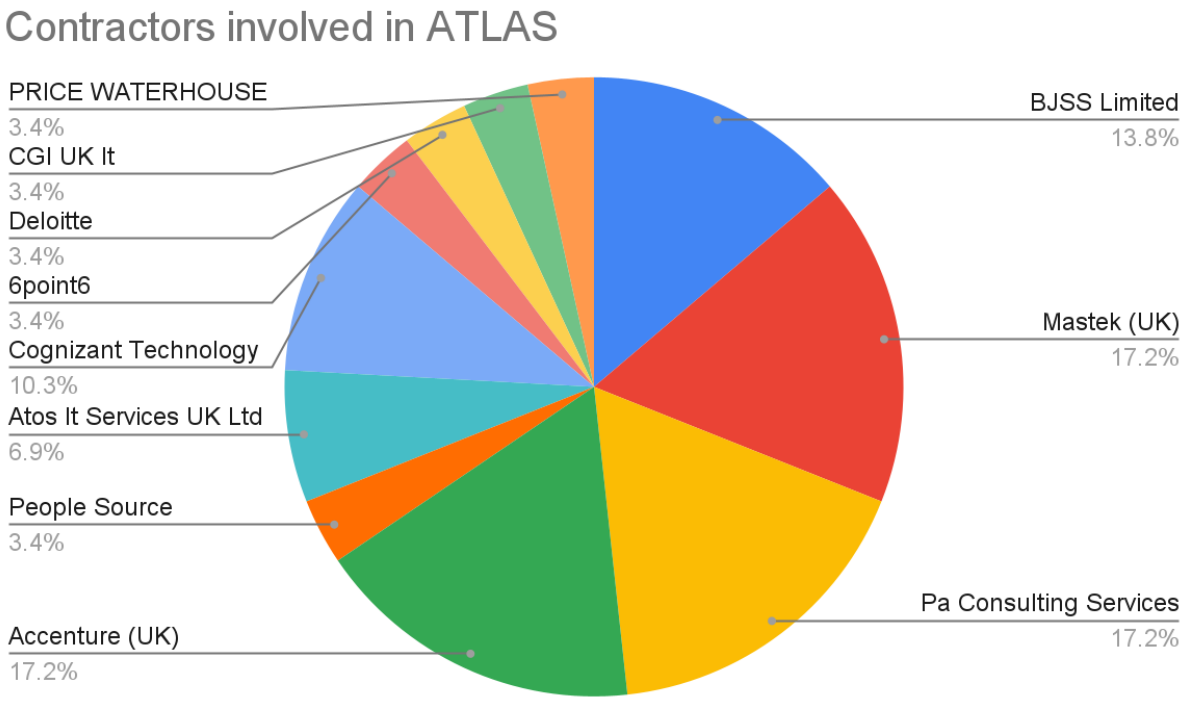
7.5.1 Delivery Team of Case working System: Mastek, Accenture and PA Consulting

The Home Office (2016c) describes the role of the delivery casework team as "support(ing) several thousand concurrent users and manage(s) decision making on hundreds of thousands of Immigration and Visa cases per year. Key deliverables include: developing configurable technology modules tailored to a specific business service need; automating existing manual, paper-based processes; and supporting decision-making to drive consistency".

There are three publicly available contracts for the project delivery of Atlas, two are described as replacements for the original Mastek contracts. PA Consulting and Accenture are the replacement service providers to deliver the Atlas project. Not stated in the contracts is the reason Mastek was not hired to continue to deliver Atlas, but the contribution of Mastek continues in other areas of Atlas' development, such as Engineering (Home Office, 2020b) and a contract to deliver the "interface" (Home Office, 2022a). Mastek was hired for £21 million to "support the business-critical case working system used by the Home Office to manage the processing of Visa applications by UK Visa and Immigration resources and provide information on applicants to Border Force and Immigration Enforcement" (Home Office, 2022a, p. 680). One of the services Mastek now delivers is "training Civil Servants" to use the technological systems. Bigo (2022) provides a lens to understand the transformation as consultants are folded into the bureaucratic structures of bordering, there is a "dematerialisation of the border and control" (p. 230). I frame this dematerialisation, via technology produced by private actors, to identify the new shape of the UK as Bigo's (2001) Möbius strip. The Möbius nature of the border is

evidenced by Mastek's role in pre-shaping how data is delivered to Home Office caseworkers, an externalisation of control to private actors, that is then fed back into the internal governance of migration decisions and governance. A clear example of this Möbius nature introduced via a technical tool is the service of Mastek to create the "Daily Dashboards", as discussed in Chapter Six, that feature data analysis and filtering to help "caseworkers" on decision-making (Home Office, 2022a) . Mastek's development of a tool in a case working database is what Bigo (2022) identifies as the reinforcement of border control via "preventive and predictive algorithms" (239). Mastek's longevity in the Atlas project points to the pattern of reliance on private actors. The chart below visualises the stake each contractor has in the construction of Atlas, based on the number of contracts not the monetary cost.

Figure 22: Pie Chart of How Many Contracts Each Private Contractor Holds for Atlas



This table is drawn from my data collection. Black and Safak (2019) report that the Home Office is "one of the departments most active in the purchase of IT services" (22). From January 2018 to December 2018 the Home Office paid Mastek "£29,820,050", Accenture "£19,949,054" and PA Consulting Services £8,957,822" in total for over 180 projects (Black & Safak, 2019). The

total cost of all Atlas contracts, I found, is £215,229,854.00. From Table 1, the hierarchies of private actors become clear. Accenture, Mastek, BJSS and PA Consulting services have the most significant stake in ATLAS.

7.5.2 Quality Assurance of Data: Cognizant and Deloitte

The Home Office describes the direct connection between PCDP as a "platform for all data created by the end-to-end Immigration Caseworking process as delivered by ATLAS" (Home Office, 2023d). A recent contract between the Home Office and Cognizant Technology Solutions UK is worth £23 million and will end in 2027. Cognizant's contract with the Home Office is 314 pages long and heavily redacted. I use this contract to clarify how the Home Office is outsourcing responsibility to "supplier" (Cognizant): for fixing "bugs… Malicious Software or incidents" that arise in case working systems.

The contractual negotiations between the buyer and the supplier are explicit in the contract. What is "black boxed" are the technical elements of the service. Below is a section from the Cognizant contract. Here, there is a demonstration of the priorities and temporal allocation created by the Home Office.

Figure 23: Person Centric Database Contract

Person Centric Data Platform

Category	Description	Response Time	Resolution Time	Service Level Performance Measure (for Resolution)	Service Credit for each Service Period
Priority 1 (P1) (Critical)	Any Incident which may cause: • the down time of the Person Centric Data Platform, thus taking products such as ATLAS offline; • a breach of network security, which may be invoked during any ransomware or any other cyber-attacks, data loss event, unauthorised access to the data, or unauthorised devices on the network; • an affect and full outage on any product linked to the PCDP; or • damage the reputation of the Home Office.	15 minutes with updates every 30 minutes	4 hours	90%	4% of the total monthly Charge for Level 3 Support and Level 3 Support (outside of Business Hours)
Priority 2 (P2) (High)	Any Incident which may cause: • the Person Centric Data Platform performance, excluding the Buyer's consumers using CSDP APIs person service, service delivery and fast reader data repositories (which uses CSDP endpoints delivering aggregated data), being impacted outside of SLA's, 200ms for our read service (thus impacting but not taking fully offline products such as ATLAS); • a breach of network security, which may be invoked during any ransomware or any other cyber-attacks, data loss event, unauthorised access to the data, or unauthorised devices on the network; or • a part outage on any product linked to the PCDP, for example ATLAS has many products which may have failed and only one (or more than one but not all) has been impacted.	1 hour	8 hours	90%	2% of the total monthly Charge for Level 3 Support and Level 3 Support (outside of Business Hours)
Priority 3 (P3) (Medium)	Any Incident which are not P1 or P2 but: • the Person Centric Data Platform performance is being impacted; however, it is not yet determined how long the impact is and onward impact to services (may result in P2); or • a mixed identity issue (where two identities inside the PCDP have been linked incorrectly) and has been escalated by Level 2 Support.	2 Business Hours	3 Working Days	90%	1% of the of total monthly Charge for Level 3 Support
Priority 4 (P4) (Low)	Any Incidents that are affecting live services, but the impact to customer is not currently felt on services attached to the PCDP. Identification of this fix is required in the SLA, but the fix itself is likely to become a change and fall into problem management.	8 Business Hours	5 Working Days	90%	-
Priority 5 (P5) (Very low)	An Incident which has been determined as a 'nice to have' by the business as a fix but is not an immediate response as per upper priority incidents. Additionally, fixes are likely to become problem records and be subject to prioritisation.	12 Business Hours	10 Working Days	90%	-

50
RM6100 Order Form – Lots 2, 3 and 5

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The section highlighted above in red demonstrates the prioritisation for Cognizant created by the Home Office. Priority One and Two demonstrate the importance of "security" and "reputation" and have resolution times of four to eight hours. Priority Three allocates "three working days, to fix : "a mixed identity issue where two identities in the PCDP have been linked incorrectly" (50). Misidentification in the migration context has unforeseen consequences: denied visas, access to asylum services and increased suspicion. Based on the initial reports from the *Guardian*, the PCDP is the system that has system errors, causing individuals to not have access to their immigration status (Taylor & Dyer, 2024). My concerns that the private actors do not have the context or experience to operate at the border are shared in a recent ICIBI report on the asylum system stated that the Home Office team are concerned about the ability for Ernst & Young to train caseworkers on the Atlas system (Neal, 2024).

On the 20th of September 2021, Ernst & Young (EY) began a contract with the Home Office titled "Provision of Consultancy and Assurance for Home Office FBIS (Future Borders and Immigration System)" (Home Office, 2021f). The Home Office describes the role of Ernst

and Young as “provid(ing) assurance, problem solving and red teaming” and was for the value of 891,000 (p. 1). ICIBI (2024) reports:

> however, DMs (decision makers) said that because the EY trainers lacked any asylum experience, they were unable to answer technical questions, meant the training was less useful. One DM told inspectors the training was online and “not fit for purpose” . A senior manager told inspectors: “they [EY] have been enthusiastic and useful, but they don’t have the background knowledge; they essentially parrot that information to the delegates, but they don’t have the required background knowledge in asylum… We probably wouldn’t use EY again unless there was another big surge, but we would still probably try to not use them (p.38).

By considering how private actors construct, design and check the Home Office’s projects contributes to examining the longevity of the technological border tools.

As mentioned in Chapter Five, Deloitte (Home Office, 2022b)was hired by the Home Office to solve the issue of “double keying”. The job description for the review of data in the change from CID to Atlas is “to provide 47 experienced operational resources to support with the **manual reviewing** and resolving an ongoing 'double keying' issue between CID and Atlas” (Home Office, 2022b, bold added). Deloitte’s role in quality assurance is to manually fix all the immigration cases that do not have consistent records. Deloitte began the external review of the data processes of the Home Office in May of 2022, due to end in November 2022. The contract between the Home Office and Deloitte describes Phase one of the project and the priority for the Deloitte team was to “resolv(e) the following elements: A person has an open Atlas case but no open CID case; A person has more than one open Atlas case; A person has more than one CID case. These discrepancies across multiple reports need to be resolved by the end of May” (Home Office, 2022b). Deloitte since the end of the external audit of data process has been granted more responsibility in the “Transition and Transformation leadership” described as the “assurance supporting continuously enhanced digital products in an Agile delivery environment” (Home Office, 2022b). Deloitte’s increasing role in assuring the quality and function of Home Office systems clarifies how the responsibility for bordering technologies is exported to the private space. The Home Office was aware that there were issues with double keying in 2022, yet the system continued to be used throughout migration governance. This reveals how the accountability and reliance on private actors is the ‘fix’ for any technological failures by exporting the responsibility of assuring data quality to Deloitte, and later the Price Water (Home Office, 2022c). What is introduced through increasingly privately produced border technology is

a new layer of technical opacity, for private companies do not have the same obligations to reveal information to the public. I contend that this technical opacity is increased as the Home Office transitions all their data systems onto cloud storage platforms.

7.6 The Digital Hostile Environment in the Cloud

The politics of data sharing in the Hostile Environment have been negotiated via several MoUs. In 2014, the UK began to formalise MoU with the National Health Service (NHS), the Department of Vehicle and Licensing Agency and the Department of Education (Griffiths & Yeo, 2021). After concerns from the public on the sharing of medical data, there has been a rollback on the extensive nature of data sharing between the NHS and the Home Office (Wilkinson, 2018). As the Home Office renegotiated MoUs with public bodies, the UK government entered agreements with private American companies like Microsoft (Donnelly, 2021) and Amazon (Crown Commercial Service, 2021a). Agreements between the Home Office and other public governance bodies, like the DfE, NHS, DWP, HMRC, inspired the investigation of the *Digital* Hostile Environment (Foxglove et al., 2021). MoUs shift the boundaries of the Digital Hostile Environment and add a layer of monetary gain for American companies. In parallel, these two companies are the "invisible backbone" (Hao, 2018) of America's border regime. Previous work on the Hostile Environment emphasised the internalisation of border checks (Donà, 2021; Griffiths & Yeo, 2021; Uthayakumar-Cumarasamy, 2020; Yuval-Davis et al., 2018) and the practice of data sharing between UK public bodies, results in discriminatory practices (Parmar, 2019). I introduce the question of *how* the technical infrastructure, private actors and the collection of data is facilitated in the UK.

Under the contract given to 6Point6, headquartered in London, the consultancy firm was hired for 28 million pounds to deliver the "technical architecture" for Atlas. 6point6, state the company helped the Home Office with the "largest cloud project in Europe" the cloud provider is AWS (6Point6, 2019). 6point6's description of the impact of the cloud migration as creating:

> new possibilities for the Home Office, enabling greater interaction and information exchange with other government bodies. Previously a request for access from another government organisation was expected to take months to address, as any changes required significant time and resource to enact. Now, with the simplified infrastructure, boundary control design is future proof which will allow the Home Office to integrate with other departments with minimal changes (6Point6, 2019).

This statement summarises the critical insight into the risks of cloud computing; (1) the creation of the infrastructure to facilitates more data collection, retention and sharing and (2) how the integration with other governmental departments can become more fluid. Cloud computing facilities the technical capabilities to support more data surveillance. As described by Villa-Nicholas (2023), “data storage is vital” for governments, like the UK and the US, to internalise borders to the public sector and increasingly relies on cloud computing.

Amoore (2021) provides a valuable concept of the “deep border” to illuminate how the intersection of computational logic expands the possibilities of borderwork and turns “all data into potential borders" (2) .The internalisation of borders facilitates the simultaneous externalisation of control of bordering technology to private companies. Amoore (2021) demonstrates that the “unmooring” of the border from focusing on the biometrics of individuals to dispersed characteristics leaves a “residue of their logic and materially changes the border long after their technical infrastructure falls away” (p. 3). Tazzioli (2024) warns that tracing algorithms as increasing automated features at the border must consider the existing racial stratification of migration governance that are not technologically bound. I heed Tazzioli’s (2024) warning that the dialogue on automation must remain connected to the politics of borders. My awareness of Tazzioli’s (2024) caution for research on borders “occluding the leeway for criticising border politics and in not presenting exclusionary bordering mechanisms as a downstream of technology” (p. 3) informs my use of the metaphor of Möbius borders. For I contextualise the external production and reliance on bordering technology with the goal to make the UK a “very hostile place for illegal immigrants” (Hill, 2017). To clarify how private actors are intensifying the Möbius nature of the UK border, I suggest that the reliance on cloud technology throughout the public governance illuminates the pattern of reliance on third party systems and the desire to increase the datafication of systems. Amoore (2021) writes, “like beaded drops of condensed data making action possible. Though the thing's movement cannot be observed directly, it is perceived obliquely through tracks and trajectories of mobility” (p. 14). I argue that we can investigate the “drops of data" shaping the action in migration governance by looking at the services rendered by the Home Office and AWS.

Cloud storage is the technical facilitator for the policy and drive to digitalise governance procedures. Simply put, the goal of internalising border control into the public sector of the UK is being technically underpinned by an external provider, Amazon. In creating more fluidity and

privatised technology to the data sharing practices between the Home Office and public sectors the creation of the *Digital* Hostile Environment is evidenced. Cloud technologies dominate the current discussion on UK digital transformation. One company, in particular, is synonymous with cloud hosting technology, Amazon Web Services (AWS), which provides 31 per cent of the market share of cloud computing (Richter, 2024). It is estimated that since 2017 AWS has received "600 million pounds" from the UK government (Waterfield, 2022). In 2021, the UK government entered an MoU with AWS for the cost of £120 million to provide the cloud infrastructure for the entire government. There has been academic and activist work critiquing the material costs of cloud computing (Amoore, 2018; Crawford, 2021; Rodrigo, 2022). Amoore (2018) argues that cloud computing is stretching, reshaping, and changing geographies. I move to apply the same strategy of the transparent contracts between the Home Office and AWS alongside the theoretical contributions of Amoore (2021).

Since 2015, the investment made by the Home Office towards AWS has increased from a payment of £6,000 (Home Office, 2017a) to £120,000,000 for a contract due to end in November of 2023 (Home Office, 2021a). The most recent public contract falls under the umbrella MoU mentioned above. As Amoore (2020) states, cloud technology built by AWS introduces flexible and fluid "intractably calculable" features for the public sector. AWS is to be considered less a stagnant data storage unit, like the Big Yellow storage units in which you can store the overflow of personal goods, and more like an ever-changing interface that users personalise for their own needs, like the app store on a mobile phone.

Reliance on third party actors for cloud hosting government data clarifies how the metaphor of the Möbius border is a key analytical framework to capture the power relations at the border. Consider my Tier 4 visa. My status and decision are all hosted on the system Atlas. My ability to prove my status, register for the doctors and enrol at my university are components of the cloud network. Internalised borders at the doctors, employers and at universities are now entangled with the external force of Amazon[21]. My internal status legitimised through data, externally connected to private actors. My data evidence the morphing of UK borders, under the *Digital* Hostile Environment, to a Möbius ribbon. As Bigo and Walker (2007) note the Möbius

[21] Crucial to note here is my interjection is not that Amazon may have access to my data, this is difficult to prove, but the introduction, reliance and optimization of data storage via an external force influences the space and shape of the border.

nature of borders is exemplified by the fact that both the observer and the subject are unable to discern the external/internal boundaries of control. The amplification on the feasibility of the Home Office to store data on cloud computing and then make operable this information brings forward the question how will future persons be made to be known?

The impact of cloud computing on governance tends to focus on notions of data ownership and spreading geographies due to storing information beyond the borders it originated within. Amoore (2020) argues that geographical power shifts can be understood as "Cloud I", in which the focus is on data, the subject and accountability within cloud computing. While "Cloud II" shifts the question from "where to how"; cloud computing introduces new possibilities for rendering persons, relations and future structures of technological endeavours. Future building and cloud technology have been discussed in critical data studies (Kitchin, 2023) due to the technical capacity of the devices to store and reuse data.

The use of this product in governing migration has yet to be discovered. A comprehensive critique of Amazon deploying discriminatory algorithms (Crawford, 2021; O'Neil, 2016) in their hiring process replicated historical practices of not hiring women, which was the result of an algorithmic system used to vet future employees. While Amazon has scrapped this program (Goodman, 2018), the historical practices of deploying technologies that replicate bias towards women raises the question of how other layers of technologies can harm certain populations. The depth of services in products like "cloud hosting" clarifies why an infrastructural lens is necessary to reveal the negotiations present in the *Digital* Hostile Environment. The drive to collect vast amounts of data has relied on the use of cloud computing and has exported the boundaries of the geographies of this information. Contextually, in implementing border checks via data sharing, there has been a simultaneous technical exportation of data power to private actors. In the next chapter, there is a turn to explore how the introduction of private actors introduces a pattern of Americanisation and blurs the boundaries of the border to a Möbius ribbon.

7.7 Conclusion

This chapter discusses the private actors used in the construction of the Streaming Tool, Sham Marriage Algorithm and Atlas. I use previous research that demonstrates the Home Office's detrimental reliance on private actors (Comptroller and Auditor General, 2020) combined with the history of private contractors contributing to technologically mediated harms.

I explore the themes of adaptability, accountability and reliance as intensifying from the use of private actors in the construction of border technologies. This chapter expands our understanding of how automated tools are deeply embedded into the digital infrastructure of the Home Office. For if we continue to see the construction of algorithms, or databases, as a vacuum system we may miss how the construction of technology today is shaping future border decision making standards.

By tracing first how the use of subscription or private software facilitated the adaptation of the Streaming Tool to the present visa allocation tool. Microsoft's role as a database provider for interface tool, Proviso, facilitates the adaptation of the Streaming Tool to update the subscription of the database, Azure, to have more automated features. The construction of the Sham Marriage tool demonstrates both the theme of adaptability and the issue of accountability. Under the authority of a technology produced by the government, the Sham Marriage Tool operates as a blurred object as the governmental agency that produced the tool is primarily made of private contractors. From a deconstruction of the private/public subsection of the Home Office, I identify how the infrastructure of the governmental body incorporates private contractors in an opaque manner. Based on the statements of the previous head of data science for the Home Office (Chaplin, 2018), the issue of accountability is clarified as the experimental and computer led practices are identified. Finally, Atlas identifies the maintenance of multiple contractors responsible for producing, maintaining and designing border technologies.

I trace how the contracts between the Home Office exchange introduce market values of efficiency and experimentation. In the agreement between the Home Office and their consultants, there is an exporting of accountability and prioritisation of their technological systems. Caught up in this negotiation is the socio-political context of the border. Data storage and analytics are untethered in the language of the contracts, when in practice they relate to an individual immigration journey and their ability to move and live in the UK. Visualising the exploration of the responsibility of bordering technology, I argue, identifies the risk to migration presently and in the future. This chapter sets up my thesis's final argument, revealing how the private features of the *Digital* Hostile Environment facilitates an "Americanisation " of UK migration governance. I turn in my final chapter to trace how the construction of the *Digital* Hostile Environment and the importance of private actors demonstrates the foundations of the UK migration governance becoming Americanised.

Chapter Eight: American Technology and the Future of the Digital Hostile Environment

In this final chapter I return to how the UK border has become increasingly internalised and dispersed throughout public governance. The purpose of this chapter is to build on the findings of how the automated border technology, the Streaming and Sham Marriage Tool, Atlas, reinforce racial bias into the decision making processes of the Home Office. I particularly flesh out the previous discussion of how private actors, through the provision of technical expertise, are building the backbone of the UK border. I focus on the trend that the digital infrastructure of the UK border is becoming increasingly Americanised, through the reliance and invitation of US private actors into the design of technical systems. My connection between the internal UK border check, the NHS, and a controversial US data analytics company, Palantir, can inspire future research into the pattern and trend of a seemingly Americanised *Digital* Hostile Environment.

Under Hostile Environment policies, the staff of the NHS is required to check patients' immigration status. In 2015, justified through protecting the cost of "health tourists", pre-emptive charges were placed on all visa holders and their dependents(The Secretary of State, 2015). At the time of writing (Summer 2024). Prime Minister Rishi Sunak announced plans to increase visa fees to fund the rise in NHS staff pay[22] and the "stop the boats" campaign, increasing surveillance at the UK-French Channel (Das & Smith, 2023). Bordering through health intensified during the COVID-19 pandemic in the Spring of 2020, in which the public glorified the NHS as the nation's defender, and migrants were increasingly criminalised and restricted under concerns of spreading the virus. In the exceptional times of COVID-19, technology and new private actors were introduced to help the NHS cope with the unprecedented challenges of the coronavirus. As previously established, borders since 9/11 have increasingly been mediated via the politics of risk (Ceyhan, 2008; Muller, 2010) and data (Aradau & Blanke, 2017; Broeders, 2007; Sanchez-Monedero, 2018) and the practices of "exceptional circumstances" have become the norm. The impact of COVID-19 policies and practices has a similar legacy of exceptionalism politics on borders in the UK.

The UK government's response to COVID-19 introduced new external and internal borders in Britain. Vaccination passports and testing for COVID-19 were mandatory for all

[22] There is no confirmation that the funds of increased visas are in practice being diverted to NHS staff, I mention this plan to reiterate the continued rhetoric on migration, the NHS and internal border checks.

passengers wishing to travel to other countries (Tazzioli, 2021). Internally, the UK implemented technology to track COVID cases; as lockdown measures eased, pubs, restaurants, concert halls and other venues required patrons to participate in the Track and Trace programme via mobile phones (Burgess, 2020). Internal borders dictated by vaccination status emerged for UK citizens and non-citizens wishing to leave their homes and re-join the broader public after lockdown restrictions kept them inside for several months. To support the UK and the Track and Trace programme (UK Health and Security Agency, 2021).Palantir, a controversial data analytics US company, was hired by NHS digital (Black, 2021). In this chapter I consider the legacies of the NHS in bordering practices to explore how the future of the *Digital* Hostile Environment has become "locked in" (Boswell & Besse, 2023) and reliant on American technology. From this reliance I argue that we can begin to think of the *Digital* Hostile Environment as Americanised.

This chapter begins with a justification for using the term Americanisation to describe the pattern of the UK public sector using US technology companies. I then give an overview of the history of the NHS and public health, post-World War II, in UK migration. Next, I cover the data-sharing practices introduced by Hostile Environment Policies. After a grounding in the historical prevalence of health and bordering, the focus is cast onto the private actor of Palantir, initially through the involvement of the company with the NHS and then directly with the Home Office. Focusing on Palantir's technology and ideological impact on the UK and US borders illuminates the 'contagious' nature of introducing private actors into health and bordering. From the insights on the impact of Palantir on shaping the power of border practices to view, correlate and make relevant numerous data sources, there is a broader examination of the technologies that are becoming the backbone of UK governance. By foregrounding how the technologies put in place today will shape what is possible for tomorrow, it can be hypothesised that UK borders are increasingly Americanised. Americanisation is a term used to encompass how the UK infrastructure is set up, reliant on and transforming itself into the dragnet (Angwin, 2014) scope of the US border. Americanisation is present not through who "owns" the data, but how American companies are monetarily and technically invested in shaping the UK borders technologies. While privacy concerns are valid, this chapter focuses on how the cementing of infrastructure can perpetuate the internalisation of borders to use vast amounts of data collected to restrict mobility rights. The influence of American companies in fortifying the infrastructure of a *Digital* Hostile Environment is seen in two new projects contracted to Palantir by

subsections of the Home Office, the Border Flow Tool and the Ukraine Resettlement Scheme. By identifying how the UK is directing the future of border practices, I emphasise that through the *internalisation* of borders there is a simultaneous splitting, fracturing and exportation of the border to private actors. I describe the internalisation via externalisation of border technology to third parties as shaping the UK border into a Möbius strip, as the role of technology, and private actors, increasingly blur the boundaries of borders.

8.1 Defining Americanisation

Americanisation is a term often associated with the post-WWII era, as American companies spread their production, management and technologies throughout Europe and Japan (Zeitlin & Herrigel, 2000). In the post-war context, Americanisation literature focuses on the implementation of American models of mass production, Keynesian economics and technologies. The transfer of logistics and infrastructure to defeated Axis Powers, mainly Germany and Japan, was part of the larger geopolitical goal of America at the time. Oldenziel and Zachmann (2009) trace how everyday technologies like the kitchen became a political battleground for the US and the Soviet Union. Early discussions on Americanisation are often associated with modernisation. Van Elteren (2003) argues that alongside the transfer of technological processes there is cultural imperialism. Reid (2008) notes that Americanisation denotes the culture of "innovation" and can be folded into the concept of a "techno political regime" (p.16). Americanisation is not a neutral term; it carries with it ambiguity and loosely connected ideas birthed from the socio political idea of America as the innovator, driver and moderniser of the post-war period (Zeitlin & Herrigel, 2000). Policy directives, like the Marshall Plan, are associated with the attempt to export the managerial models (Kipping, 1998), yet there is no unitary or cohesive American Model (Tomlinson & Tiratsoo, 1998). Americanisation can be considered something imposed by America, like the transfer of managerial experts to Japanese companies, but has been considered as a self-imposed phenomenon (Kipping, 1998). I mention the geopolitical history of the process of Americanisation not to make a claim on the impact on American industry on Germany or Japan post-war world II, but to trace the history of American politics and policy transported through their technological companies. The process and methods of Americanising industries is not a linear project; there is resistance and rejection, as will be explored later on in this chapter, by local actors. From the discussion on how

Americanisation of technology, standards and practices occurred after WWII, contextualises the new phase of US technological power, Silicon Valley.

Rhetorical reference to Americanisation can be seen in the reverence for the technology companies from "Silicon Valley" and the attempt of the country to develop internal technology prowess (O'Mara, 2011). Adams (2017) argues that Silicon Valley's role in promoting the "military-industrial" complex increased during the Cold War, as the technology firm was the "ground floor for communication technology" (p.330) and is synonymous with innovation, and limitless expansion (Villa-Nicholas, 2023). Silicon Valley, the name of a region in the Bay Area of California, south of San Francisco, has become synonymous with debates of "big Data" (O'Neil, 2016; Villa-Nicholas, 2023; Zuboff, 2020). The influence of Silicon Valley, and the culture and mythological narratives on the unlimited capacity for change, technological utopianism, is the new "American Model" being promoted globally. For the larger geopolitical battles, the race for technology, such as Artificial Intelligence, cyberwarfare and advanced weaponry, make it so that the production teams for these devices stand to gain both vast amounts of capital and political sway (Sanger, 2018). Silicon Valley has been framed as a technological imaginary, or a "set of practice-based beliefs, individual and collective, implicit and explicit, about the role of technology in social life and social change" (Ferrari, 2020) that promotes the exportation of techno solutionism (Morozov, 2014) and the creation of a global community. Ferrari (2020) argues that the fusion of California Ideology and the "bohemianism of San Francisco with the hi-tech Industries of Silicon Valley" promotes a fashionable and "infectious" wave that endlessly supplies information technology (p. 45). Behind the cool, casual and innovative myth of Silicon Valley, the ethos being promoted is a culture of "neo-liberal self reliance and technolsolutionism" (Kneese, 2023, p. 9). As Taplin (2017) argues, the initiative of "Move Fast and Break Things" from the social media company Facebook, describes how the monopolisation of digital technologies by libertarian entrepreneurs is shaping global politics. Noble and Roberts (2019) argue that the exportation of the culture of Silicon valley fits into the "post racial paradox" and that "bias is operationalized in Silicon Valley, yet its poetic rendering as a simple matter of shared taste and worldvie(w) obfuscate the discrimination that are part of a larger American culture and is both reflected and reified in Silicon Valley's" (p. 7). I build on Noble and Robert's (2019) critique of the "culture" promoted through Silicon Valley companies as a vehicle of normalising and obscuring discriminatory power relations by tracing how the UK

has, and is currently, invested in Americanising technical infrastructure. In 2010, the UK launched the initiative of a "Tech City" that attempted to build a technological hub in East London that was later called "Silicon Roundabout", given its proximity to Old Street and the attempt to replicate the "distinctive" hub of innovation from the US (Nathan et al., 2019). By tracing how the process of Americanisation began to spark academic interest in the post-war period and exploring the rhetoric and exportation practices of Silicon Valley, it is possible to consider how power relations are exchanged through the export of the American model.

8.1.1 Americanisation and Private Actors

The previous chapter ended with the discussion on the proliferation of private actors in cloud computing being the backbone of the *Digital* Hostile Environment. I argue that by tracing the process of Americanisation there can be richer insight into how politics, culture and the ethos of American companies are transferred to other countries alongside the development of technology. As the case studies and supporting literature have proven, the process of using technology and datafied systems reinforce and replicate racialised outcomes (Benjamin, 2016; Browne, 2010; Chun, 2021; D'Ignazio & Klein, 2020; Eubanks, 2018; O'Neil, 2016; Skinner, 2020). We have explored how private interests intersecting at the border introduces themes of making technology more adaptable and raises issues of the accountability and reliance of the Home Office on contractors (Bigo, 2022; Boswell & Besse, 2023; Zedner, 2022). Americanisation foregrounds the racialised practices that often result from social relations among private contractors and Home Office officials. Benjamin (2024) develops the concept of the "new Jim Code: the employment of technologies that reflect and reproduce existing inequities but that are promoted and perceived as more objective or progressive than an discriminatory system of the previous era" (p. 11). Jim Code reinterprets the Jim Crow laws, a set of laws and social practices intended to separate and subordinate Black populations in America, after the formal end of slavery. Benjamin (2020) draws from Alexander's (2012) argument that as Jim Crow laws were outlawed, the age of "colorblind" mass incarceration of people of colour ensued in the US to maintain racial hierarchy. I mention the US literature on the legacies of slavery, Jim Crow and mass incarceration (Gottlieb & Flynn, 2021) to argue that the legal and social devices may change, but the power relations of domination remain.

Private actors and racialisation are explored in the American context (Alexander, 2012; Villa-Nicholas, 2023) drawing on the cycle of an "industrial complex". This intersection of

private actors, control and race are brought into the framework to explore the new pattern of the UK adopting similar practices. The cycle of the industrial complex delineates how private actors become contributors and reinforcers of the political process, primarily used in the context of policing and prisons. A key feature in the perpetuation of an industrial complex is the proliferation of "race-neutral" technologies and policies which, in practice, discriminate against racialised populations. Alexander (2012) argues the privatisation of prisons and policies like the so-called "War on Drugs" are all pursued through "race-neutral rhetoric" but reinforce a feedback loop that discriminates against racialised persons. A similar industrial complex is emerging from the ashes of the Hostile Environment and is reinforced through technologies and American private actors. The technologies discussed in this thesis contribute to tracing the formation of infrastructurally skewed systems. Crucially, to build a digitally enforced border, infrastructure is required.

Critical data scholars argue that American technology companies are contributors to producing digital systems that reinforce a politics of exclusion - domestically and internationally (Angwin et al., 2016; Crawford, 2021; Lamdan, 2023; Villa-Nicholas, 2023). Deep inequities in the producers of technology in the US, as D'Ignazio and Klein (2020) argue, continue to erase and devalue the knowledge and experience of women. As the computer engineer teams at Silicon Valley firms consist of a higher percentage of male engineers, designers and project leads (Broussard, 2023), the impact of technology on female users may continue to be excluded. Criado-Perez (2019) argues the "data gap" of technology companies excluding the knowledge and experience of female users results in negative impacts to the health and safety of women and reproduces stereotypes of them. At the intersection of race, technology and gender, Noble (2018) argues, the search engine algorithm designed by Google reinforces harmful stereotypes of Black women. For critical race and critical data studies, scholars (Benjamin, 2020; boyd & Crawford, 2012; Broussard, 2023; Browne, 2010, 2015; Chun, 2021; Noble, 2018) focus on *who* is producing the technology that is proliferated throughout governance and everyday life to identify the pattern of racialised and gendered technological power relations. I rely on a similar recognition of the social construction of the tools and contexts that private companies contribute to the design and features of border technology. There is a significant risk that an Americanised *Digital* Hostile Environment may include not only the exportation of the tactics, expertise, and computing abilities of the US, but an ideology that reshapes sociotechnical relations in the UK.

From the discussion on how Americanisation has been perpetuated through technology and private actors, I will now focus on the context of how borders and health intersect in the UK. Before we can identify how the influence of the American company, Palantir, influences the future of the *Digital* Hostile Environment, there must be an examination of how the NHS has been involved in UK bordering practices.

8.2 Health and Borders

Health institutions, concerns and practices have historically influenced bordering practices. Bashford (2006) argues that we can view the contemporary policies and technology deployed, like those used during the COVID-19 pandemic, as historically racially informed methods of control. Public health became a means for nation-states to limit or halt mobility during the COVID-19 pandemic. *Title 42* was an emergency measure introduced in March 2020 by President Trump to "swiftly" reject asylum claims at the border (Gramlich, 2022). Refugee camps, in the EU, used the pandemic as a justification to keep migrants contained (Tazzioli & Stierl, 2021). In critical migration studies, health and border practices are framed via humanitarianism politics (Aradau, 2004; Perkowski, 2018b). This literature reveals the gendered and paternalist logics that emerge from the mixing of care of control (Pallister-Wilkins, 2020; Sahraoui, 2020). However, humanitarianism as a lens does not capture the aspect of exceptionality produced by COVID-19. The logic of care and control extended beyond migrants or refugees (Ceyhan, 2008) to protect public health during the COVID-19 pandemic. I move from the contextualization of how health, humanitarian and borders have been considered in critical migration studies to consider the historic and current role of the NHS in UK migration governance.

Health management has been used as not only a tool to control borders, but a historical technology to perpetuate racial division. The NHS was introduced after WWII in 1948 and provided free healthcare for all (Webster, 1998). In the aftermath of the war Britain faced a labour shortage and needed workers to work on the massive reconstruction project and in the newly founded NHS (Simpson et al., 2010). Haynes (2017) traces how the recruitment of Commonwealth citizens was a necessary policy choice to staff the NHS, but it caused public tensions over the settlement of these employees in the UK. Healthcare professionals were scarce in the UK post-WWII, and the government turned to advertising job vacancies throughout the commonwealth to attract talent to work in the NHS. Women were recruited from the Caribbean

to work for the NHS (Batnitzky & McDowell, 2011). The Windrush Generation (Reddie, 2020) were met with difficulties accessing housing; they had to contend with violence and racial discrimination. Borders post-WWII were opened to specific workers but, in the subsequent years, would be transformed into an institution, by the UK government, as needing to be protected *from* migrants.

Terms like "health tourism" and benefit tourism" have become politically salient terms to popularise policies weaponizing the NHS as a border agent (Goodfellow, 2020; Yeo, 2020). Migration scholars problematise the formulation of the government's articulation of "pull"[23] factors (Garelli & Tazzioli, 2021). The articulation of the risk of 'health tourism' can be seen in the rhetoric of UK public servants. For example, Jeremy Hunt, former Secretary of Health, states:

> having a universal health service free at the point of use rightly makes us the envy of the world, but we must make sure the system is fair to the hardworking British taxpayers who fund it. We have one of the most generous systems in the world when it comes to healthcare for foreign visitors, but it's time for action to ensure the NHS is a national health service – not an international one (Department of Health and Social Care & Home Office, 2013)

Hunt's portrayal of the need to protect the NHS from becoming an "international" health care provider summarises the politics of care and migration. A statistic posted by the Home Office that the NHS loses "500 million pounds a year" due to treating foreign patients helps establish a justification for the Government to impose new sanctions and technologies to monitor NHS patients. After Hunt's announcement of a "crackdown on health tourism" (Eaton, 2013) the solution proposed was to introduce new technology, like using NHS numbers, to identify if an individual was required to pay for health services. The NHS becomes a material keystone for how economics, migration and health are all transformed into border control technologies. In practice, the extension of border checks and assurance that foreign nationals are not entitled to NHS services does not reap monetary gains for the institutions; hospital trusts spend more to recover fees than they gained from their collection(Yeo, 2020). The evidence that the NHS is not an effective border control does not sway the Home Office from continuing to involve health

[23] Pull factors are described as the government's framing of why there must be harsh restrictions to the restrictions of social benefits, and access to employment, for migrants. Based on the articulation of "pull factors" the government believes to provide employment and health care to all would attract more migration(Garelli & Tazzioli, 2021).

professionals in immigration checks and leaves Yeo (2020) to conclude that the use of medical professionals resembles a “moral crusade” which disproportionally impacts ethnic minorities in the UK. The NHS has become embroiled in maintaining the internal borders of the UK. From this overview on how the NHS is used as internal border control, there can now be consideration of how technology facilities the function of immigration checks in the health sector.

8.2.1 Data Sharing between Home Office and NHS

Data-sharing agreements between the NHS and the Home Office have been informally mandated since 2013 (Papageorgiou et al., 2020). In 2017, a formalised agreement of data sharing between the Home Office and the NHS was introduced through a MoU (Home Office & Department of Health, 2019) . With the new MoU, the NHS was transformed into an active border control agent. Previously, the Home Office may have called upon the NHS to confirm details of an immigration case. As of 2017, the medical institution was responsible for checking the immigration status of all persons. NHS staff needed to check documents and proof of status before providing care (unless life-threatening, immigration status could be checked post-intervention). People within the UK who may not have legal status do not seek medical treatment out of fear of being asked to produce documentation about their status; this hostility appearing in the health sector threatens individuals' well-being and national health concerns. Huws (2020) noted that the risks to migrants' health and public health were acutely felt during the COVID-19 pandemic, as there was an apprehension from migrant populations in seeking vaccinations, treatment or advice regarding the virus. COVID-19 illuminated how creating fear and apprehension affects wider public health, as having portions of the population not willing to seek medical attention during a pandemic increases the risk of the virus spreading. The introduction of border control in the medical profession creates tensions within the NHS and its staff.

Tensions between care ethics and border control have been reflected in medical journals and (Papageorgiou et al., 2020) by activist groups like Doc Not Cops. The MoU NHS during the Home Office demonstrates that the statement “raw data is oxymoron” (Gitelman, 2013) as the collection of immigration status is steeped with social bias. Critiques of using the NHS as a border actor highlight that medical professionals are not trained as agents of bordering and may result in the reliance on racialised and misogynist tropes to determine which individuals were checked. NHS staff could rely on “foreign-sounding names”, accents (Coddington, 2021) and appearance (Bivins, 2022) to determine which patients to ask for immigration status. Dobbin and

authors (2022) found that the practice of NHS charging is gendered and 63 per cent of all the immigration health charges were to women. Cassidy and colleagues (2023) report migrant women seek alternative means for maternal care and that "refusal is the only way to evade border violence embedded in maternity care through the charging regime" (p. 204). The risks of perpetuating racialised and gendered harms has been considered by the NHS; the solution proposed was the introduction of technology.

The NHS is aware that requiring staff to check immigration status may lead to the use of stereotypes and racial profiling to inform the patients that are monitored (Camden and Islington NHS Foundation Trust, 2022). To stop the use of tropes to check immigration status, the NHS and Home Office introduced a red, amber and green banner algorithm that can assist in the policing of borders. The tool that acted as a means of communication between the Home Office and NHS is the "Message Exchange for Social Care and Health (MESH)" (NHS Digital, 2023). As revealed in a guidance report for staff at Camden and Islington Hospital, there is a feature on "Spine", which is a collection of services used by the NHS to share and manage patients, that flags individuals red, amber and green if they are likely to need to pay for care (NHS Digital, 2023). Risk assessments dictated by the traffic light colours are like the Streaming Tool (Chapter Three). A technological device internally making people visible in the medical space raises the question of what data is being used to create this device. The Department of Health and Social Care (2024) state:

> MESH is a tool that allows an OVM (Overseas Visitor Manager) to bulk check patients status, to aide in identifying those most likely to be chargeable, by submitting a list of NHS numbers and dates of birth to the NHS SPINE. This should be used on a daily basis for all new referrals and all new inpatient episodes of care. OVM MESH must only be used for the purposes of overseas visitor cost recovery" (p. 29)

Data sharing between the Home Office and the NHS is fluid and subject to change evidenced in the announcement, in August 2023, of the creation of a Home Office "reference number" for "relevant migrants" (Quinn, 2023). As the formal MoU between the Home Office and the NHS ended in 2017, concerns for the introduction of a "back-door" into the surveillance of migrants in the health sector were raised by NHS staff and migrant groups (Quinn, 2023). Information on the creation of the new reference number " called uid2" is limited to the Guardian article, but what can be ascertained from the creation of a new digital service to identify migrants is the continuation of the Hostile Environment policy to use the welfare state as a border control point

(Guentner et al., 2016). The previous NHS relationship with the Home Office contextualises the harms of data sharing between the healthcare sector and border agents. By considering the practice of data sharing as perpetuating racialised power relations the discussion of how Palantir's and Americanisation's role in transforming the data analytics in the NHS poses a risk to migrant and marginalised communities. As we have discussed the historical ties between health and borders and the changing data sharing agreements between the Home Office and the NHS, we can now consider the private actor Palantir. The discussion on Palantir is relevant as the company has been awarded multiple contracts with the NHS with the goal of enhancing the interoperability of existing health databases (Hoeksma, 2022).

The concept of contagious borders can help explain how the process and standards of private actors, like Palantir, once introduced into one sector of border control, the NHS, can spread to other aspects of migration governance. Dijstelbloem (2021) untangles the nature of borders by tracing how infrastructural compromises become contagious. Through the lens of compromises, or contracts, the NHS and Palantir become increasingly nefarious for future bordering practices. By proxy, the NHS and Palantir partnership contributes to migration governance, as the border was internalised into the healthcare system. I focus on the pattern of contagion of the UK using Palantir as a supplier to identify how practices that once were used at an internal border check, the NHS, spread to other components of migration governance. I cannot speak deeply on the infrastructure and the technical components of the Palantir software, as I did in previous chapters on algorithmic systems, but I reveal the larger impacts of capabilities of data analytics on the UK border. I do not argue that the emergence of bordering within the health sector is new. I instead trace how technology and private contractors are influencing the capability and visibility of migration governance. From the discussion on the practice of data sharing between the Home Office and the NHS, there now can be an overview of how the company, Palantir.

8.3 Who Is Behind Palantir

"We are giving you {the British Government} the single most successful enterprise product in America. The most difficult place to win in" Quote from Palantir CEO, Alex Karp (2023)

The two co-founders of Palantir are Peter Thiel, founder of the company PayPal, and Alexander Karp. Palantir's name is derived from the Lord of the Rings series - inspired by an "all-seeing stone" – offers a valuable insight into the company's character. Thiel and Karp are the public figures associated with Palantir for they represent Palantir in the media (*AI and the War in Gaza,* 2023; Thiel, 2016). Thiel is a self-described Republican-libertarian supporter and contributor to former US president Trump (Thiel, 2016). Since its founding, Palantir has targeted government departments (Balakrishnan et al., 2020). Contrary to Thiel's sentiments in 2007 (Read, 2020), of being an anti-statist libertarian, Palantir has grown into a global surveillance private contractor, out for hire to Western governmental departments. Thiel's contribution of 1.25 million dollars to Trump's campaign grabbed headlines (Streitfeld, 2016), but his politics have influenced the direction of Palantir.

As described by Chafkin (2022), Thiel saw technology as "fundamental to the rise of Western civilization and American power" and in the wake of 9/11 invested his fortune from PayPal into building technology that would capitalise, fuel and grow the "industrial-military complex" in the US (p. 34). Thiel's vision for Palantir blossomed from the surveillance and data practices that the US government used on the ground in Iraq and Afghanistan (Weinberger, 2020). Rumours circulated in the press after the journalist Mark Bowden identified two technological projects-one loosely tied to Palantir's role of data analytics for "Total Information Awareness program"- used during the operation to assassinate Osama Bin Laden (Chafkin, 2022). Thiel and Karp used the alleged involvement of Palantir with the assassination as a marketing ploy for the company's software (Greenberg, 2013). Cafkin (2022) argues:

> prospective clients—financial services companies, corporate security departments—didn't care if Palantir was too good. In fact if it was too invasive, so much the better. They wanted military-grade technology, to hire the company that got bin Laden, and Thiel and Karp were ready to sell that to them. "It felt like we were on top of the world at that point," said a long-time employee. "A lot of people started knocking on our doors". Palantir's success would enrich Thiel dramatically, as the company's valuation would grow from $2.5 billion in 2011 to $9 billion two years later." (p. 35).

Palantir's capital gains from the involvement with US government agencies captures the ethos of the company, and the cultivation of the mystique of their software as a means of attracting more potential customers. Influence of the militarised origins of Palantir informs the construction and function of their software. Just as technology has been demonstrated to be a non-neutral entity the companies that design, market and provide services have their own aims. By

considering the origins of Palantir there can be a richer understanding of the social context that may be introduced to technological system via their products.

Palantir's Chief Architect Akshay Krishnaswamy states, in a promotional video for Palantir, "a lot of how we think about our software today is informed by those learnings in the front line in Iraq and Afghanistan deployment"(Palantir, 2022a). Krishnaswamy's statement illustrates how the products of Palantir were initially developed for the military context. I thematically connect the COVID-19 exceptional politics with Amoore's (2013) exploration of the rise of risk analytics post 9/11, the technical features of Palantir's software serves as a tangible example of the exceptional contexts. In a promotional video titled "Palantir Gotham for Defense Decision Making" Meredith Doran (Palantir, 2021a), deployment strategist, showcases how the software of Gotham can be used to "navigate the fog of war". Military contracts help, as Villa-Nicholas (2023) argues, private contractors improve the capabilities of their technologies in "diverse environments" be they in warfare or at the border (p. 37). Google and Amazon, have faced resistance from their employees for working with the American government (Shane & Wakabayashi, 2018) creating internal pressure for the companies not to pursue contracts with governmental agencies. Palantir rejects that working for the government warrants resistance, rather the company promotes that they want employees that desire to improve state technical system. This sentiment is expressed by Karp (2023), the now CEO of Palantir, says "we (Palantir) want people who want to be on the side of the West, making the West a better society, more able to defend themselves, protect data protection. And that's not for everyone." Karp's declaration that Palantir may not be "everyone's cup of tea" is paired with enthusiasm that the employees of the company must be aligned with the "side of the West". Present in Karp's enthusiasm for working closely with American, and allied countries (Karp, 2023) is the ideal of transporting American ideals, alongside technology, or the phenomena of Americanisation (Tomlinson & Tiratsoo, 1998). For Palantir, the involvement with Western governments has grown the company's revenue to over two billion dollars (Karp, 2023).

Karp (2023) states that "Palantir should be an instrument, a technical digital software instrument, which is again, what we, I think are the best at in America, that strengthens institutions both commercial and economic and political in Western countries." At the Aspen Group (The Aspen Institute, 2022), Karp explains Palantir's involvement with the Ukraine War. In his speech he mentions that part of the company's brand and status is linked to their work with

"The United Kingdom, Israel and the United States" as a selling point to potential clients. Palantir's founder, and current CEOs, insist that the role of Palantir is deeply connected to the economic and political project of the West (Karp, 2023). This foregrounds why the company's involvement with the NHS offers an example of the process of the Americanisation of UK governance agencies. For the NHS, as discussed above, is a component of internal border checks. Given this illustration of the ethos of Palantir as a private company, there now can be an examination of their involvement with the NHS.

8.3.1 NHS and Palantir

From the context of the Palantir connected and promoting American 'values' there can now be a consideration to the influence the company may have on the digital capabilities of the NHS. Campbell (2023) reports there are concerns by the UK public over the "unprecedented" sharing of health data with an American private actor. This chapter does not focus on the concern over Palantir's access to data, but how Palantir offers a revealing case study of the process of the Americanisation of the *Digital* Hostile Environment.

Palantir's involvement with the NHS began with the COVID-19 pandemic. On the 12th of March 2021, the NHS bought the "Foundry" data analytics software for one pound sterling (Shead, 2020). The trial services with Palantir for the COVID-19 database grew from one pound to a contract worth £15 million pounds six months later. The current contract for the NHS is valued around £330 million pounds to build the Federated Data Platform (NHS England, 2023).The deals between Palantir and the NHS were constructed as non-bids, meaning only Palantir could receive the contract. Construction of an exclusive deal was brewing over dinner cocktails and sales pitches on how a partnership can elevate the ability of the NHS Trust to transform health via data(Meaker & Browne, 2023).

Palantir's software can synthesise information from various sources, enabling border control to make visible persons at and beyond the geographical border. Browne (2015) and Benjamin (2020) both politicise the intersection of technology and the power of visibility by historically tying the practice to racialisation. In surveillance studies, attention is directed at how algorithmic knowledge can transform persons into risk (Lyon, 2019; Raley & Amoore, 2017) and inform future action of actors (Lally, 2017). As discussed in Chapters Three, Four and Five algorithmic knowledge is embedded with racialised relations (Angwin et al., 2016; Broussard, 2019; Hanna et al., 2019). By exploring the technical capabilities of the software sold to the

NHS, my critique of American companies becomes crystallised: that the privately produced technologies facilitate the new power to connect data sources, information and people. For a deeper investigation on the technical capabilities introduced by Palantir, I examine the software licensed to the NHS, Foundry.

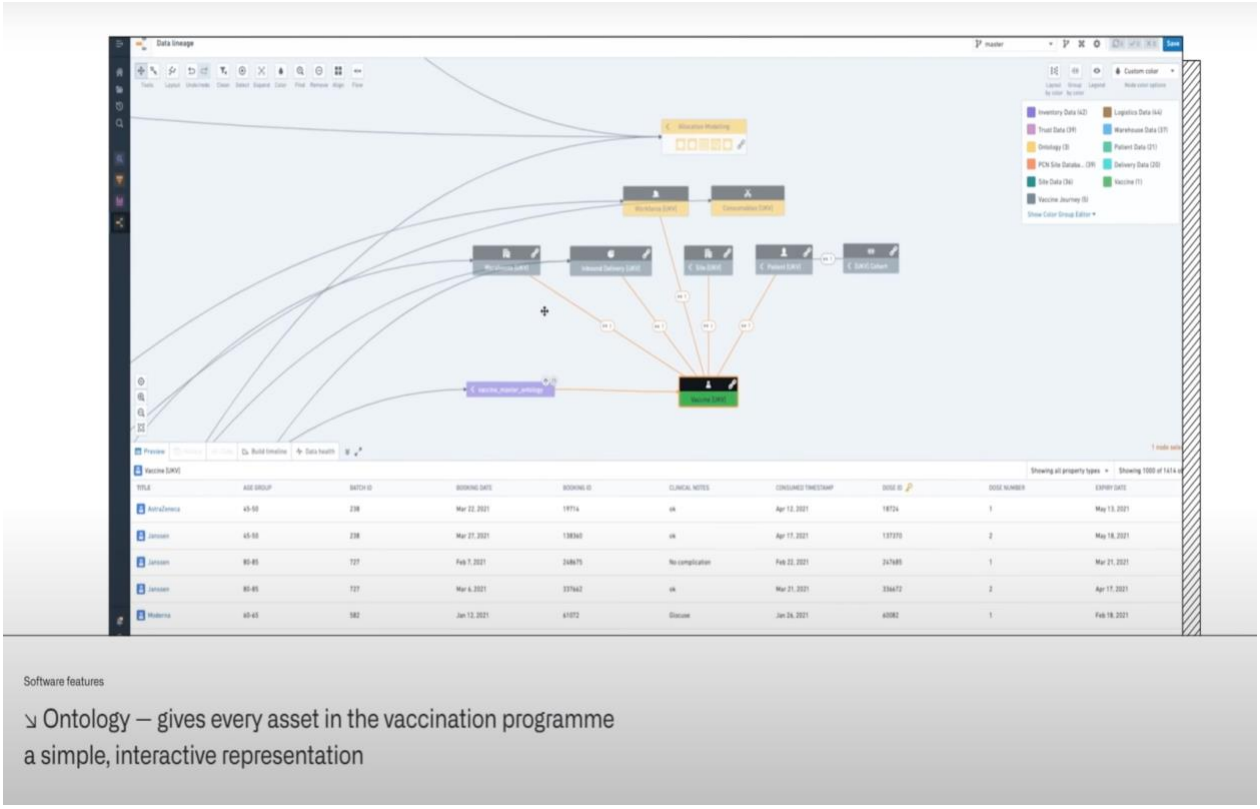
8.4 NHS and Foundry Software

The software sold to the NHS is called Foundry, described as a platform for the modern enterprise. Foundry has been described as helping the NHS make crucial decisions about vaccination distribution, availability of hospital beds and the distribution of personal protection equipment for health workers (Palantir, 2021b). Palantir describes the Foundry software's relationship with the NHS:

> To use an analogy: Foundry is to NHS data what spreadsheet software is to the contents of a spreadsheet. Just as the author of a spreadsheet can - whenever they desire - export its contents to another spreadsheet software, the NHS, as the data controller, can - without hindrance - export its data from Foundry into other data management software (Palantir, 2020).

The description of the Foundry system, which emphasises Palantir's marketing of Foundry, and publicly made available documents offer insight into how the software can pull data from various streams to inform actors' decisions. As described in Palantir's promotional video, Foundry transforms the "assembly line" of data to the user (Palantir, 2022). Foundry is a system that is an "operational feedback loop" that can transform the already existing data systems and connect these sources in a singular system. Palantir refers to the power of Foundry's "ontology" in transforming the possibilities of data. Hacking (2004) uses the term ontology to understand the transformation of categories, classifications and how objects and relations are understood. In a promotional video titled "From Insight to Action with the Ontology" (Palantir, 2022b), Karp (2022b)recognises that Ontology is "very academic term" that is "hard to define". Palantir's Ontology connects "Foundry" with "real-life objects" that can "power decision making" (Palantir, 2024). Possibilities of "operational knowledge" drives the logic of the Foundry software. The below is an image from the Palantir website visualising how Foundry activates ontology.

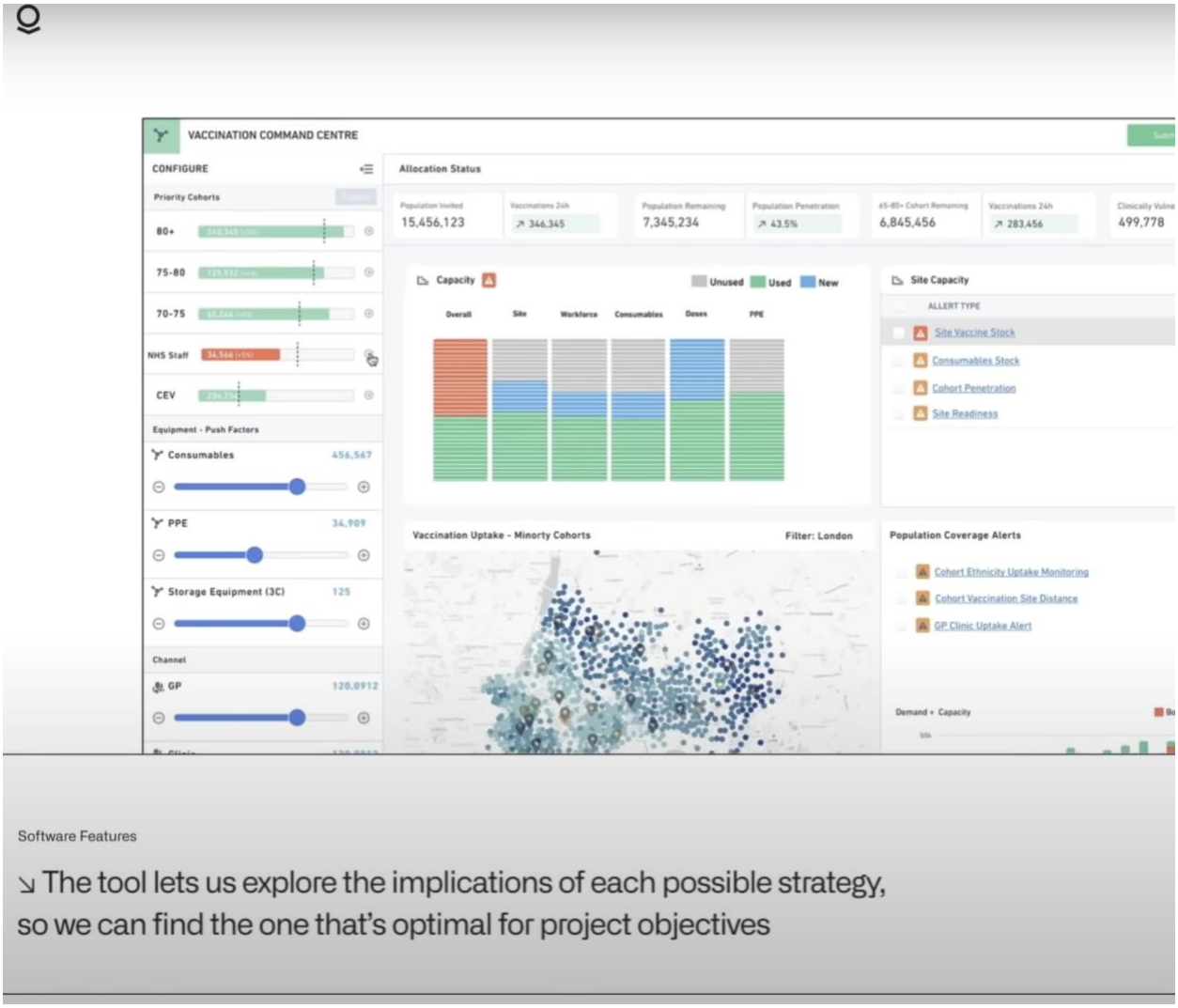
Figure 24: Ontology of Palantir



(Palantir, 2021b)

In this visualisation the ability for Foundry to connect various streams of data to real world objects is represented in each of the nodes of the map. In Ontology, there is the connection of "inbound deliveries" with a "NHS Patient" to the type, batch and availability of a vaccination. As the ability to connect different streams of data is optimised through the Foundry solution, Palantir demonstrates how the new operational data can inform "future action" (Palantir, 2021b). The below image visualises how the Foundry transform data relations into the deployment of vaccinations.

Figure 25: Foundry and the NHS Vaccination Programme



(Palantir, 2021b)

Based on the technical ability of Foundry to connect various streams, evidenced through the COVID-19 vaccination scheme, we can begin to question what the technology will mean for the NHS in the future as their role as internal border agents. From clarification on how the Foundry system in practice can bring together, and make traceable, data streams for the NHS, there now can be a discussion to the resistance by public actors against the use of Palantir in the health sector.

8.4.1 Resistance to Palantir

Palantir's introduction into the NHS has not been a linear project but has been resisted by civil actors. Foxglove and Open Democracy have brought legal cases against Palantir since the posting of the £ 1contract over COVID data (Crider, 2023). Advocacy groups raised concerns over the lack of transparency in the handling of data (Balakrishnan et al., 2020), the implications of an American company with a connection to the American military (Satariano, 2023) and the concern for data privacy (Campbell, 2023). Transparency for Privacy International and No Tech for Tyrants (2020) have voiced "consistent concern" for all companies that partner with the government, particularly Palantir, for the company has cultivated a reputation for secrecy. One of the most common forms of resistance towards the lack of transparency is the filing of FOI requests (Crider, 2023). On the public hosting site "whatdotheyknow", there are 500 results for FOI request to Palantir activities within the UK government. Within the NHS there has been a campaign from doctors focused on removing border checks from the NHS. Docs not Cops hosted protests and campaigned against the use of a private actor having access to patient data.

Docs not Cops is a national coalition of "NHS professionals and patients" resisting the spread of borders in the healthcare sector. Campaigns towards a "fairer and free" NHS drive Doc Not Cops in their protest (B, 2019) and their campaigns in the media. Migrants Organise, a UK-based NGO, connects the work of Palantir with bordering practices in the US to resist the use of the provider in the NHS. Migrants Organise argue that by applying "pressure" to the private actors, it is possible to leverage the "different motivation of private actors, profit" (Migrants Organise & K. Narita, personal communication, 8 November 2022). Migrants Organise problematise the sharing of health data, which can:

> sound nebulous yet… there are very real ways I think that is a very real and concrete way of understanding it, right, turning service providers into border guards or turning the GPS office or your school into a border checkpoint. Because it is not just about the policy, it is about this system of, ordering really, and how bordering creates these hierarchies of exclusion. The other thing I'll say, though, is that the way that data sharing can become very, can be very abstract, but it is something that creates this culture of fear that I really, I think is, is salient." (Migrants Organise & K. Narita, personal communication, 8 November 2022).

Migrants Organise's framing of both data sharing as a component to the creation of "hierarchies of exclusion" and the spread of fear ground the contextualisation of Palantir contributing to the data systems in the NHS. For the culture of fear, or spreading of hostility, through digital

systems speaks to the core problem of my thesis. For Huws (2020), the changing rules and regulations for the NHS's role in checking immigration status establishes a fear in migrant communities of seeking medical help. As Migrants Organise (personal communication, 8 November 2022) say, "this is not just about policy, it is about this system of ordering". The perpetuation of the *Digital* Hostile Environment is not only about the exportation of policy into digital systems; it is also about the spreading of fear and the maintenance of "hierarchies of exclusion"(Migrants Organise & K. Narita, personal communication, 8 November 2022). NHS officials argue the building of a federated data platform will allow for the different NHS sectors to "speak to one another " (Atkins, 2023). In technical terms, the platform is about increasing the interoperability of all data systems. Victoria Atkin, Secretary of State for Health and Social care, described the platform as follows:

> the FDP is software that will sit across NHS trusts and integrated care systems (ICSs), allowing them to connect data they already hold, such as health records, waiting lists, and theatre and staff rosters, in a safe and secure environment, to better manage patient care. The FDP will support key priorities of the NHS, including recovery of elective care and the improvement of discharge processes to get medically fit patients treated and home quicker (Atkins, 2023).

Data sharing between the Home Office and the NHS, and with an American company, are some of the central arguments for NGO's resisting the spread of the *Digital* Hostile Environment; they work to make public the unique threat of individuals' health records. The capital gains of the Palantir are another central critique.

The practice of sharing health data is a vocal point for problematising the private actors of the NHS. Private actors frame health data as a "goldmine" of data resources that will help enrich data analytics (O'Shaughnessy, 2023). The complexity of health records, treatments and conditions and provide Palantir an opportunity to improve the data analytics of their software by correlating unconnected data into cohesive information. Simply, the more dispersed data sources the software, Foundry, uses, the better the tool will be at correlating information. We can think of the complexity of health data as rich resource for Palantir to improve. An analogy to illustrate this relationship would be: the better the learning material for a student the greater impact on their understanding of a subject. Baroness Boycott illustrates the benefit of NHS data for Palantir during a Parliamentary debate:

> Palantir is a data analytical company. It wants our data. In cases where it has been in business with other people, it has used that data and sold it under the surveillance capital model. Is the Minister absolutely confident that we are safe in entrusting all of the NHS's data to an American company? It seems to me that that is not in the best interests of a not-for-profit organisation such as the NHS. (*NHS Procurement*, 2024).

Boycott's statement identifies the risk of inviting Palantir to create the Federated Data Platform. The mention of the "surveillance capital model" draws on Zuboff's (2020) definition of the process as "a rogue mutation of capitalism marked by concentrations of wealth, knowledge, and power unprecedented in human history" (8). The surveillance capital model, offers that, the extraction of human experience, in this case health data, contributes to the technical abilities for Palantir to improve the technical capabilities of their products. In the context of Palantir under the model of surveillance capitalism directs attention to the fact that regardless of if the American company can sell, access or share NHS data there are capital benefits, due to the improvement of the company's data capabilities. As mentioned above, the service of Palantir data analytics is the ability to pull different streams of data together; these data sources may not be structured or labelled in the same manner. Health data includes variables, inputs and different sources of information all on the same patient.

The main concern the NHS addresses is the privacy issue raised by the public, that personal health details will be stored, shared and managed by the US company. Booth (2023) argues that the issue with Palantir may not be directly accessing patient data, but the NHS as a governing body does not correctly audit the data processes. Booth (2023) further explains that due to the military and security basis of Foundry there are high levels of data audits, or limits to users access to data, yet the NHS as the data controller does not have the technical capacity to monitor the flows of data. Booth's (2023) observations inform my critique of Palantir in the NHS, which does not go through ideals of privacy-not to say these are not crucial-but traces the pattern of contagious relations with a data analytics company in UK governance. When we consider the process of the Americanisation as facilitating new practices, it is possible to consider the contagious nature of both Palantir's services and tools. As the exact access and capabilities of the new FDP are not known, Boycott's (2024) critique that an American company should not be entrusted with the data of the NHS underscores the risks of exporting responsibility beyond the geographical boundaries of the UK. From the initial use of Palantir by

an internal border check, the NHS, there has been a spread of the company to building bordering technology, this demonstrates the contagious nature of Americanised systems.

8.5 Palantir and the UK Border

In July 2022, then Home Secretary Priti Patel, announced the plan for the Home Office to create a fully digital border (New Plan for Immigration: Legal Migration and Border Control, 2022). One initiative to help deliver a digital border was to use Foundry to develop "border flow" technology (Crown Commercial Service, 2020). Under the contract "Back Office Software", the Cabinet Office contracted 31 suppliers for the value of £1,200,000,000 to supply the products. These were to be "used by Central Government Departments and all other UK Public Sector Bodies, including Local Authorities, Health, Police, Fire and Rescue, Education and Devolved Administrations" (Crown Commercial Service, 2021b). One of the suppliers for the Back Office Software was Palantir and the specific role of the company is described as "Provision of a Foundry Data Connector - Technical Feasibility Evaluation (TFE)" and is valued at £27,108,546 (Crown Commercial Service, 2020). The contract between the Crown Commercial Office and Palantir reveals how contagion of the logics implemented on the "inside" of the border, or in the NHS, is reused to maintain the "external" frontiers. This contagion and continuum of practices reinforce the border as a Möbius strip, the inside and outside are indistinguishable. The involvement of private actors serves to form the Möbius strip. Palantir's new role in subsections of the Home Office demonstrates how the actor's influence is spreading throughout UK migration governance.

Codified in the initial trial contract between Palantir and the Cabinet Office is the geopolitical justification for the technological service being rendered (Crown Commercial Service, 2020). This contract contains an agreement to maintain the Foundry software beyond the termination of the contract, due to end in March 2024. The contract states:

> Drawing on the learning from the COVID-19 response, we intend to work with departments to test the feasibility of the Palantir Foundry and specifically their Data Connector as a means of integrating with the range of border systems and exchange data. The Foundry product removes the barriers between back-end data management and front-end data analysis. This functionality lends itself to use within a cross Government borders context where the data is federated across multiple departments, but overarching analysis of that data is required centrally, as seen in the COVID 19 response (Cabinet Office, 2021).

As the contract outlines, Palantir's introduction to the NHS during the pandemic, and the ability of the Foundry to bring data streams together, drew other sections of the government, like the

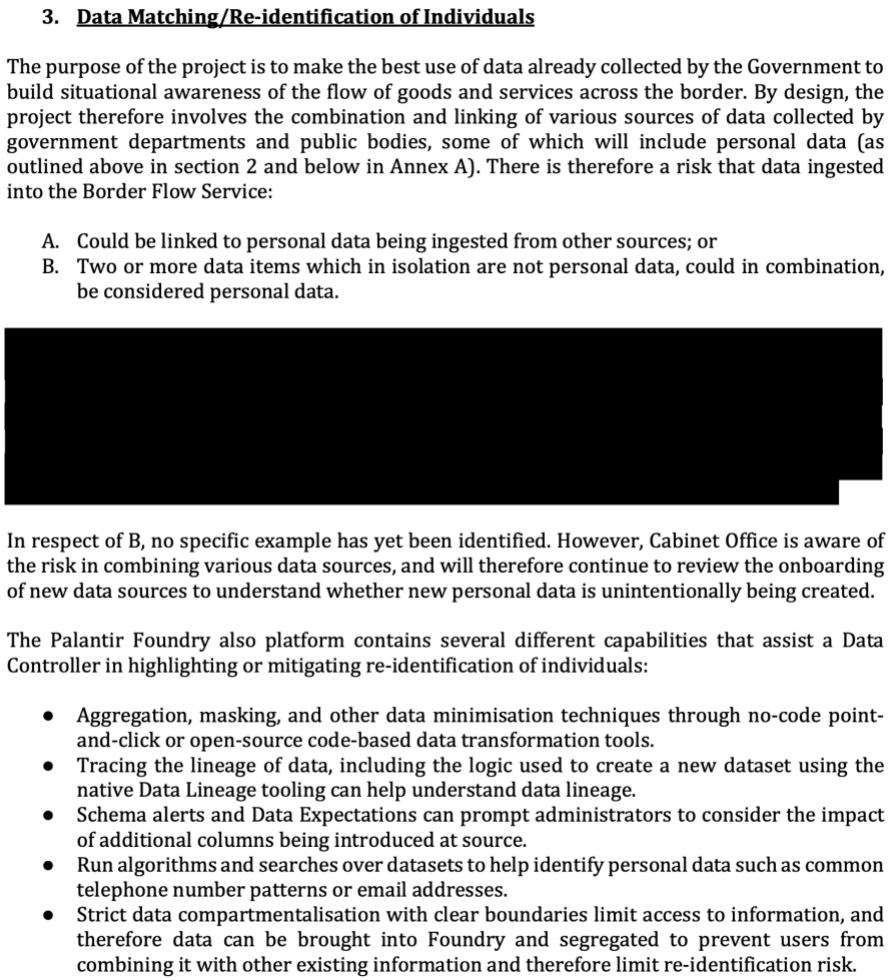
Cabinet Office, to hiring the company. A familiar pattern emerges in the Cabinet Office's "testing the feasibility" of the Foundry product across the government; it is the implementation of Palantir within a government office as a trial run. As discussed above, the contract between the NHS and Palantir began their relationship with a trial run for the price of £1, that developed into over 550 million pounds of contracts between the two entities. The Cabinet Office uses the ability of Foundry to integrate different data streams across government departments as justification to trial Palantir in the border context. The trial of using Foundry to build the Border Flow Tool ends on the 31st of March 2024 (Crown Commercial Service, 2020).

We have explored in the previous chapter how digital tools shape how border actors view, decide and manage migration. Border Flow is a tool that would facilitate the sharing of data from various governmental departments. The new border project is an intensification of connecting data sources from the internal control sectors of the UK government departments and projecting this information to the external frontiers arranged through private software, i.e. Foundry. The Crown Commercial Office (2020) states that the programme:

> Will combine information across multiple sources from government departments, public bodies and industry. Data gathered through the Border Flow Service will be used by the Border Operations Centre to monitor and manage flow at the end of the Transition Period and support relevant authorities to better manage border controls (p.1).

The integration of the Border Flow tool, that automates data sharing illuminates how the Hostile Environment logics are furthered by technology. Legacies of internalisation of the border via technologies like the Border Flow programme promotes and facilities a future of migration governance capable of further datafied knowledge of people. The Border Flow technology promotes data sharing with HMRC, The Home Office, the Department of Transport, the Department for Environment, Food and Rural Affairs, the Cabinet Office, Kent Police and Open/commercial source data (Cabinet Office, 2023). The new access to a "near-time view of flow at the border" through the Foundry platform is crucial in formulating the intersection of Palantir and the Home Office. In the DPIA form on the use of the Border Flow tool, there is acknowledgment that matching data from various sources pose risk. Below is a section describing of the formulation of these risks.

Figure 26: Palantir and the Data Flows Project



3. **Data Matching/Re-identification of Individuals**

The purpose of the project is to make the best use of data already collected by the Government to build situational awareness of the flow of goods and services across the border. By design, the project therefore involves the combination and linking of various sources of data collected by government departments and public bodies, some of which will include personal data (as outlined above in section 2 and below in Annex A). There is therefore a risk that data ingested into the Border Flow Service:

A. Could be linked to personal data being ingested from other sources; or
B. Two or more data items which in isolation are not personal data, could in combination, be considered personal data.

[redacted]

In respect of B, no specific example has yet been identified. However, Cabinet Office is aware of the risk in combining various data sources, and will therefore continue to review the onboarding of new data sources to understand whether new personal data is unintentionally being created.

The Palantir Foundry also platform contains several different capabilities that assist a Data Controller in highlighting or mitigating re-identification of individuals:

- Aggregation, masking, and other data minimisation techniques through no-code point-and-click or open-source code-based data transformation tools.
- Tracing the lineage of data, including the logic used to create a new dataset using the native Data Lineage tooling can help understand data lineage.
- Schema alerts and Data Expectations can prompt administrators to consider the impact of additional columns being introduced at source.
- Run algorithms and searches over datasets to help identify personal data such as common telephone number patterns or email addresses.
- Strict data compartmentalisation with clear boundaries limit access to information, and therefore data can be brought into Foundry and segregated to prevent users from combining it with other existing information and therefore limit re-identification risk.

(Cabinet Office, 2021).

Demonstrated in the DPIA the Crown Office is recognising the risks and stakes of pulling different sources of data together. To overcome this risk there is a familiar pattern of relying on the technological solutions of private actors, Palantir in this case, to reduce the harm of creating a "situational awareness" (Cabinet Office, 2021). As established in previous chapters, the pattern of techno solutionism (Morozov, 2014) in the UK border is not new, but as Boswell and Besse argue (2023) relying on private actors to manage these systems creates a political lock in. Knight and Geeker (2020) argue the "governing power" of the ICE, the immigration agency in the US, database that uses Palantir software "stems most deeply from its method of bulk and cumulative information aggregation that works to individuals and reduce people to "targets" "subjects" and even "items of interest" whose identities are determined solely by an algorithmic assessment of

interrelated data points" (p.241). Framing the impact of Palantir on the border power of the US through its ability to correlate data streams and to produce risks informs my critique of the Border Flow Tool. While the "data" may be controlled by government agencies Palantir's software is facilitating the ability to transform persons into actionable border intervention targets, making them subject to deportation, arrests or surveillance. The Border Flow Tool proposed technical data analytic capabilities, and the reliance on Palantir, is a tangible example of the reinforcement and cementation of the *Digital* Hostile Environment, in that the attention of the border actors turn inwards.

Another example of Palantir's involvement with border practice is the trial programme for the Ukraine Resettlement Scheme. After the invasion of Ukraine by Russia, the UK created in March 2022 a scheme that gave UK nationals the ability to sponsor Ukrainian families resettlement (Walsh & Sumption, 2023). As of the 28th of August 2023, 131,000 people have come to the UK under this scheme. In the rollout of the scheme, the Department of Levelling Up and Housing and Communities (DLUHC) began a six month trial of the Foundry software to launch the program (National Audit Organisation, 2023, p. 12). From trialling the software the DLUHC extended the services to now include a contract with Palantir worth 4.5 million pounds (Department for Levelling Up, Housing & Communities, 2022). The NAO reports that after concerns for the procurement of a contract without public tender, the ability for other companies to bid for the service, the DLUHC investigated whether the department could switch providers. The DLUHC "found a number of issues" (National Audit Organisation, 2023) with migrating the Ukraine resettlement scheme and extended the contract with Palantir for another 5.5 million pounds (p. 12). On the 12th of May 2023, the DLUHC responded to my request on how data is shared between the Home Office and Palantir with a link to a public statement on the privacy concerns for the Ukrainian Settlement Scheme.

The DLUHC and the Home Office are both "data controllers" for the Ukrainian scheme (Department for Levelling Up, Housing and Communities & Home Office, 2022). Data is not sent or stored beyond the UK, besides to a "data analytics" service that DLUHC uses as a provider. As for Palantir's role in data services, the scheme states that "DLUHC has required in its agreement with Palantir that data held by the company" must remain in the UK (Department for Levelling Up, Housing and Communities & Home Office, 2022). From the statement that data held by Palantir will remain in the UK, there is confirmation that the company does have

access to data, what is unknown is the type of information held. Access to migration data illuminates the increasing responsibility and role Palantir on future border practices. The current contract with Palantir and the DLUHC is set to end in September 2024. We do not know if there will be a continuation of either the use of Palantir or the Resettlement scheme, but from the NAO (2023) concern the problem may not be on data privacy, but the lock-in effect of privately produced systems. After the trial of Foundry, then the extension of the contract, and the further extension, the reliance on Palantir in a subsection of the immigration network begins to emerge. Palantir's free trial has been contested by the public as an "infectious way" (*AI and the War in Gaza*, 2023) for the company to further monopolise contracts with the UK government (Atkins, 2023). As the contagious nature of Palantir's role with UK data projects has been explored, first in the context of the NHS and finally with Home Office adjacent agencies, there can now be a comparison to Palantir's influence on the creation of a Möbius border.

8.6. Palantir and Möbius Border

The metaphor of the Möbius ribbon (Bigo, 2001) connects how the topology, function and shape of the border is altered due to the capabilities technologies. Important for Bigo (2001) in the creation of the Möbius border is how the internal/external security practices were blurred, through the coordination of police and military action. In the sense that "inside and outside no longer have clear meanings for the professionals of threat management. A Möbius ribbon has replaced the traditional certainty of boundaries" (Bigo, 2002, p. 76). From Bigo's (2002) statement that the inside and outside are no longer distinction for border professionals, the technologies that facilitate the transformation of the blurring of boundaries are recast. For if the internal and the external are no longer distractive, and border surveillance is spread beyond the demarcation of boundaries, we are left with the question how this practice is conducted. For Bigo's (2001,2002) Möbius ribbon is formed from the coordination of national police, and the seemingly international military, I recast the practice to consider the technology that makes possible the collection, use and weaponisation of data from beyond the border. Palantir's private software solutions the Home Office may increase the ability to make traceable information from other governmental departments, in turn, enhancing the ability to make life in the UK unliveable for migrants. Blurring between the internal and external is a clear finding of the Hostile Environment policies (Griffiths & Yeo, 2021; Guentner et al., 2016; Yuval-Davis et al., 2019), yet if the stance of the UK government were to remove the internal border checks from practice,

the administrative technology has the technical infrastructure to continue the Möbius nature of the border. As the UK border becomes more reliant on digital technology, we must consider who, how and why technology is used. One way to hypothesise how the border technologies introduced today, Border Flow and the Ukraine Resettlement Scheme, may influence future standards and practices is to consider the impact of Palantir of the US border.

I mirror Knight and Gekker's (2020) shifting analysis away from "data concerns" regarding ownership and collection to focusing on the responsibilities and governing impact technology has on users. Through mapping the interoperability of data through a Palantir-based database, Knight and Gekker (2020) argue the proliferation of information contributed to immigration raids. The Integrated Case Management system (ICM), integrated with Palantir technology, can collect data from utility bills, live cell phone data, social media, healthcare and the Department of Motor Vehicles and create visuals of profiles for individuals and those connected to them (Mijente et al., 2018). The main case working system for ICE is called FALCON, which is built on the Palantir software Gotham. The software Gotham was developed by Palantir specifically for the use of governments, to connect various sources of data, or databases. Foundry, the software now used by the NHS, Cabinet Office, and the DLUHC is the commercial interpretation of Gotham. In simple terms, Palantir as a company began as a government consultant for the CIA, and they developed their products to transform government data practice. When Palantir wanted to expand their commercial interests to other sectors, they created Foundry. While Gotham and Foundry are different software solutions, the effect of Palantir's operation on transforming the ability of border agents to make operable data is similar in both products.

Privacy advocates in the US criticise the use of FALCON to connect data sources to inform immigration raids, which consists of immigration enforcement actions within the boundaries of the US that aim to identify individuals who do not have legal status in the country. The Electronic Privacy Information Centre cited the data stored on the ICM system to include "name, date of birth, and Social Security number; and descriptive data like eye colour, hair colour, height, weight, and unique physical characteristics (e.g. tattoos). The ICM also includes financial data, location related data, licence plate reader data, and telecommunications data" (Electronic Privacy Information Center, 2020, p. 6). Immigration raids are as Villa-Nicholas (2023) describes, conducted through a "network" that is part of the dragnet politics of the ICE of

turning the deportation regime beyond the external border of the US-Mexico border to an everyday feature of politics. An example of the connection to Palantir technology, FALCON, which connects multiple governmental agencies. FALCON's data sources included personal details from school records to family relations, inform almost "a hundred raids of 7-Elevens across the United States"(Crawford, 2021, p. 195). The FALCON platform is a mobile phone app that is designed to give law enforcement agents the ability to "search through a fusion of law enforcement agencies" (Joseph, 2019).

Parallels can be drawn between the initial contract of Palantir with ICE and the construction of UK border data analytics, as both projects facilitate the visualisations and connection of migrants' movements. Crawford (2021) notes the interoperability introduced via the FALCON technology as it is a conduit between data sources and mobile phones of immigration officers, in which they can access photographs and back-end information from any geographical location. Foundry, as a technical solution, facilitates new knowledge available for border agents, and creates new forms of visibility for migrants within and beyond the external US border. By illustrating the known data flows and interfacings of ICM, we have attempted to make clear the potential power ICM, and thereby ICE immigration officials, possess to dehumanise the individuals ICM virtually represents. Moreover, we seek to visualise the typically obfuscated nature of surveillant assemblages with this interfacial regime map and situate ICM as a key component within America's border regime (Knight & Gekker, 2020).

Palantir's misinformation on the scope of their involvement with bordering practices skews the current "Border Flow" project and risks repeating the pattern of contagious relations. Bordering via revealing networks of association is explored in surveillance literature (Castells, 2010) and migration literature (Glouftsios, 2018; Ploeg & Pridmore, 2015; Sharma & Sharma, 2013). Both sets of scholars problematise how social relations, communities and associations become weaponised by actors. Repercussions of networked surveillance at the border are brought to the surface primarily via the lens of "risk" (Amoore & De Goede, 2005). Risk and data politics have begun to directly address the racialisation (Daniels, 2015; Parmar, 2020; Stachowitsch & Sachseder, 2019) occurring in producing threats at and beyond the geographical border. The theme of Americanisation contributes to the overall intensification of a blurred boundary of UK's internal/external frontiers invites other scholars to trace how the infrastructural projects of today are shaping tomorrow's borders.

8.7 Conclusion:

This chapter connected the internalisation of the border via the NHS with the simultaneous contagious nature of inviting the American company Palantir. Through tracing the relationship between the NHS and Palantir, there is the argument that the *Digital* Hostile Environment is increasingly Americanised. Palantir embodies the exportation of the American model into the internalised border check of the UK, the NHS. Palantir is a brainchild of the CIA and has created a reputation for embedding the US government data surveillance capabilities. From an overview of how Palantir's role in the digital systems of the NHS are contested by civil actors, through the lens of privacy and the spread of the Hostile Environment, there is a clarification for how borders can become contagious in the UK. When we identify how the software used to build the NHS new Federated Data Platform is now used to surveil the external boundaries of the UK, in the Border Flow project, the technical capabilities of surveillance and data analytics are increased. The use of the Foundry system can be viewed beyond a critique for privacy but to consider how the increase of datafied knowledge of individuals, shared between governmental agencies, pose risks. The facilitation of data sharing via Foundry contains the contract between Palantir and the Cabinet Office that the Kent Police, HMRC DVLA and the Home Office will be connected through a singular dashboard. An investigation on the production of a data analytics tool that connects multiple UK governmental agencies, using Palantir software, evidences how bordering technologies are transformed by private actors. The themes of adaptability, accountability and reliance, introduced in Chapter Seven, emerge in the discussion of the influence of Palantir on future border practices. As the border projects discussed, Border Flow and the Ukraine Settlement Scheme, are ongoing the establishment of the pattern of American data analytics influencing the technical capabilities of migration governance systems introduces the question of how the future border will be constructed. Imagining the UK border as the Möbius ribbon grounds how creating a *Digital* Hostile Environment reinforces logics of racialised exclusions. Through the simultaneous internalisations of border checks with the exportation of responsibility to private actors, there is a displacement of the locus of power in a blurred continuum, creating ambiguous points of tension.

Chapter Nine: Conclusion

What is a *Digital* Hostile Environment? Why should we consider the administrative technology of the Home Office as a vital component of border power? While border decisions may never be fully opaque to the applicant, nor the technology used to support the administrative process, this thesis has unearthed the sociotechnical infrastructure to extend our understanding of the longevity of the Hostile Environment, and transformation to the digital. Hostility emerges not only through the desire to make the UK an "unliveable place"(Hill, 2017) for migrants but as a guiding standard for tactics of bordering. Goodfellow(2020) remarks that when trying to conceptualise the Hostile Environment we must remember that " anti-immigration politics do not manifest itself in neat and contained ways" (p. 200) some of the tactics to spread hostility may be tangible, whilst others are out of sight. In the wake of the Windrush Scandal there was a shift by the UK government to claim the new policy direction is that of a "Compliant Environment" rather than a hostile one. However, in practice and in outcomes the similar logics that led to the thousands of UK citizens being stripped of their rights in the Windrush Scandal, the mentality to continue to introduce technology and private actors into internal ports of border control remain in today's Home Office.

Much of the Hostile Environment tactics were aimed at breaking, altering or changing the politics of belonging, that evoke a racialised series of practices. Whilst under the guise of anti-immigration policies the mechanics of delivering the Hostile Environment targeted certain populations, be that of the Caribbean descent of the Windrush generation, or the residents of racially diverse neighbourhoods who had "Go Home Vans" driven thought their streets (Jones et al., 2017). My research has traced how the racialised exclusionary policies have solidified as norms during the Hostile Environment can be seen though the functions, and dysfunctionality of the Home Office's administration technology. By tracing the different systems that are supporting visa decision making, management of immigration data and the private actors responsible for building the technology I have revealed the longevity and replication of exclusionary politics are furthered through the automated digital systems of the Home Office. My research teases out that the categorisations and ranking of individuals are conducted by technologies that are designed and poised to replicate and reinforce past social relations. I expand and refine our understanding of the *Digital* Hostile Environment to consider how the

infrastructure of the Home Office is technically poised to project the past of migration into the future of bordering practices.

In my conclusion, I recap the findings of the case studies and explore how our definition of the *Digital* Hostile Environment has expanded. I will bring together the concept of the Möbius border. I build on the metaphor of the Möbius ribbon throughout the chapter, with Chapters Four, Five and Six contextualising the different technologies shaping the standards of decision-making by the Home Office. The blurring of internal/external boundaries in applying the Sham Marriage algorithm uses dispersed data inputs to dictate the likelihood of a couple being in a fraudulent relationship. In discussing how the Möbius border is a helpful framework to capture the internalised border checks, with the technological outsourcing of migration governance, we can begin to see how the future of the border is being constructed. After considering the Möbius nature of the border, I reiterate why we must account for the private actors working on border technologies. In Chapter Seven, I draw out how adaptability, accountability and reliance on technologies emerge as we identify how private software and actors build border technology. I finish the discussion of the private actor's themes with a proposal for further research into the *Digital* Hostile Environment. In Chapter Eight, I examine how we can see the contagious nature of private actors, like Palantir, who enter the migration governance in one way and begin to spread their influence on others. I urge further research into how border and government technologies have become increasingly Americanised. A contribution made from my investigation on the infrastructural nature of the *Digital* Hostile Environment is to consider how the tools used, built and applied at the border today are shaping future practices. If we look to the future of bordering, using the evidence that algorithmic systems are poised to replicate and reinforce past patterns of social behaviour (Chun, 2021), the future of migration governance is technically poised to perpetuate historical bias. Before we explore the two themes of the Möbius border and the future of borders, I return to the findings of the case studies.

9.1 The Case Studies

In Chapters Three to Five, I examine different uses of automated decision-making systems used by the Home Office. In Chapter Three, I introduce the algorithms used to risk assess visa applications. The Streaming Tool evidences how the racialised outcomes of automated systems are perpetuated. From this case study, I build on critical data and infrastructural studies to deconstruct the Streaming Tool as a networked tool that can be

redesigned and reworked to operate in a similarly biased manner, in a technically opaque manner. Legal interventions for the Streaming Tool focus on the direct input of an applicant's nationality as a risk factor, as this violates the Equality Act of 2010. By beginning the investigation on how technologies have transformed and contributed to the infrastructural embeddedness of the *Digital* Hostile Environment with the Streaming Tool, we can see how the Home Office frames automated tools. While the Streaming Tool was scrapped by the Home Office after the JCWI and Foxglove filed for further information on the use of nationality in the automated tool, the Home Office did not recognise that the algorithm was racially discriminatory. What arises from the lack of recognition of the relationship between algorithmic and racialised outcomes sets up how the replacement tool is infrastructurally poised to replicate similar outcomes but through a different technological device. I trace how, as we consider the supporting networks of the Streaming Tool, the out-of-country interface for Home Office workers, Proviso, and the casework database CID, demonstrates that we must not consider algorithms as being in a vacuum. Seeing the Streaming Tool as a socio-technical device, both through the contextualisation of the border space and the function of algorithms, begins to address how technology can reinforce past migration governance patterns. I clarify in the discussion on the Streaming Tool that while consideration for nationality and race at the border is not new, what is introduced with the technology is splitting between overt codification and the technical opacity of algorithmic systems. Digital codification is present in the direct input of race into the Streaming Tool. Some claim that the blatant use of race as a feature of risk assessments helps shed light on the biased practices of the Home Office. Yet this argument misses two major points: (1) the inscription of race as a feature in the algorithmic process redlined mobilities of countless travellers for over the five years the Streaming Tool was in operation, and (2) makes accountability for the border technology rely on codified harms to occur before there is intervention. Through my contribution to border studies, I demonstrate that by using an infrastructural and critical data lens, we can critique and make visible the patterns of technology *before* there are socio-technical mediated harms. I build on the need to deepen our conceptions of algorithms at the border by exploring how racialised outputs can occur without the direct input of protected characteristics.

Chapter Five explores how algorithms can perpetuate racialised outcomes without the direct input of nationality. This chapter builds on how technologies are poised to reinforce past patterns of migration decisions and are contextualised as a historical tool for controlling diversity within the UK. Gender plays a role in how the practice of disciplining migration marriages becomes clarified as an aspect of how the Home Office historically views the risk of certain relationships. The discussion on the previous technologies and assumptions used to discern the validity of relationships expands on how using several data inputs into an algorithmic system reinforces social tropes in particular populations. Historically, deciding whether a couple is truly "in love" has been based on gut feelings or unregulated social bias conceptions of real relationships. I trace how the gut feelings of Home Office workers, marriage registrars and the public are now codified into the logics of the Sham Marriage algorithm in a technically opaque manner. Based on the findings of PLP, the Sham Marriage in practice disproportionality red risks assessed EU nationals. In this chapter, I reverse engineer how the Sham Marriage tool is poised to reinforce racialised and gendered tropes and, in practice, produce outcomes that redline certain love couplings. Based on the known data inputs, travel history, age difference and registrar's notes, there is a deeper contextualisation of the Sham Marriage tool. By contextualising how the data inputs have historically been used to control relations between UK nationals and non-UK nationals, the question is how the design of tools contributes to the racialised results of automated decision-making systems. The discussion on the technically biased logics of the Sham Marriage tool clarifies how there can be an inscription of racialised modes of belonging towards EAA citizens. I address whether the Hostile Environment has been digitally uploaded by exploring how automated decision-making tools dictate internal features of belonging, introducing new risks to relationships between UK and non-UK citizens. Chapters Four and Five provide evidence of how automation is efficient and often in an invisible manner, reinforcing biased migration decisions. From the discussion of how the design and placement of border technologies intersect with racialised notions of belonging, I examine how we can critique technical systems before there are codified harms.

Atlas, the Home Office caseworker system in development, differs from the earlier case studies. As Chapters Four and Five focus on algorithms used to assess visa and marriage applications, Atlas is a larger system used to store, share and manage all migration data in the UK. My earlier investigation into Atlas focused on how if we know that, in practice, algorithms

are technically poised to reinforce past migration patterns, to develop a system that incorporates automated features in how Home Office caseworkers are managing all migrants, internally and externally, encompasses the embeddedness of the *Digital* Hostile Environment. As my critique of the Streaming and Sham Marriage tools relies on the outcomes of these systems being discriminatory. A new theme emerges in Chapter Six: how technological harm can be perpetuated by technologies that are not working. A recent Guardian article (Taylor & Dyer, 2024) reveals that due to technical failures, migrants who are asked to prove their status to access employment, health care and benefits have been unable to do so due to data failures in Atlas and based on the human impact of the Hostile Environment policies facilitating the border checks internally, combined with the reliance on technology to facilitate the ability to check status. My findings of the insecurity produced by Atlas clarify how the *Digital* Hostile emerges in a fractured and dispersed manner. From the theme of how the technical failures in the *Digital* Hostile Environment facilitate making the internal space of the UK unliveable for populations, the question of "who" emerges. From my research on Atlas, I discovered how private actors are embedded in maintaining the *Digital* Hostile Environment. The case studies I explore assits in the expansion of defining the *Digital* Hostile Environment.

9.2 Revisiting the *Digital* Hostile Environment

Liberty, JCWI and Foxglove(2021) began the briefing on the emergence of a *Digital* Hostile Environment by connecting the Home Office's desire to spread internal border control to public services relied on data sharing agreements. Another core tenet of the debate on the Hostile Environment in 2021 was the push to have a fully digital border by 2025, that started with hosting all of the EAA with leave to remain post-Brexit on digitally only status. Focus for civil actors like Migrants Organise (personal communication, 8 November 2022) was connecting the inherent racial discrimination of the Hostile Environment with the practices that were using digital technology to spread the omnipresence of border control to certain populations. Early in the public debate on the existence of the *Digital* Hostile Environment was a reckoning that there needs to be a consideration for digital technologies, as these were the tools that made possible the operationalisation of internal border checks. To have the NHS as a border guard there had to be new technologies to share data between GP workers and Home Office case workers. Earlier protestations on the digital tools of the Hostile Environment were stating that the technology

would increase the efficiency and make it easier for the Home Office to deploy more surveillance. In essence, the earlier debates treated the technology of the Hostile Environment as a vehicle to deliver the exclusionary politics. I expand and refine the definition to reveal the technologies are both a vehicle and driver of policy.

My case studies reveal the embeddedness for how racial bias and exclusion can manifest through the automated tools used by the Home Office to decide, rank and manage visa decisions. My exploration of two algorithms that risk assess visa applicants and have both recorded disproportionally flagging certain population as a greater threat. Both the Streaming and the Sham Marriage tool evidence that in the background of Home Office administration are technologies that under the guise of efficiency and neutrality are reinforcing past social relations of what populations have access to reside, visit and settle in the UK. A crucial finding of my research is to show that the longevity of these tools can be found in the sociotechnical infrastructure of the Home Office. I expand the political landscape of the *Digital* Hostile Environment to think beyond the technologies that directly support the internalisation of borders to other tools that are helping maintain the goal to restrict movement of certain populations. By identifying the goals of the Hostile Environment in the back-end of the Home Office's administration there is a reiteration on why we must consider how technology is being designed and implemented at the UK border. I refine how we approach researching technology by focusing on a system that was in development, Atlas, to test the theoretical claims on using infrastructure and critical data studies to unpack the power relations of border technology. By exploring how the digital technology is designed at the core to consider protected characteristics as a way of ranking and hierarchising mobility, this is found in the integration of the Home Office's business rules, and how the infrastructural compromises made for the case working system poise the technology not to work. My discussion of Atlas overlaps with the initial criticism of the *Digital* Hostile Environment that the reliance on technology to store immigration status would produce instability for visa holders. I use this finding to expand how research can critique technology *before* there are documented harms to try and promote more transparency for how systems are developed. Atlas as a case study evidences that my methodological approach, informed by data feminism principles, contributes to how future research can be conducted to explore not only the black boxing of technologies logics but how the governance and infrastructural compromises are being obfuscated. By using a myriad of methods and evidence to

reveal the infrastructure of technology I help inform future work to adopt a new lens of how border and technologies are operating, and how to gain access to closed off spaces. My final contribution to the expansion of the *Digital* Hostile Environment is the private actors that are contributing and shaping the design and technical ability of bordering systems. Beyond my contribution to the academic consideration for the *Digital* Hostile Environment I suggest a new way to conceptualise the UK border that ties together the blurriness of boundaries introduced through the internalisation of borders, the Möbius ribbon.

9.3 A Möbius Border

A Möbius ribbon, or strip, is a mathematical figure that makes exterior and interior indistinguishable. I use the metaphor of the Möbius border to capture how the *Digital* Hostile Environment has changed the shape and features of the border. Vaughan-Williams (2009) states "the problem with continuing to think in terms of borders, separations and distinctions, in the ways that the modern geopolitical imaginary and a conventional logic of inside/outside do, is that it is a mode of thought ignorant of such blurring or fuzziness" (p. 102). By considering the fuzziness introduced by the Home Office's adoption of technological solutions to manage governance, there can be a richer introspection on 'who' maintains border technology. As Chapter Two discusses, we can no longer consider the border as a territorially bound, linear and solid object (Balibar & Williams, 2002; Wilson & Donnan, 2012) but as upheld through a series of standards, practices and actors. My engagement with the active process of bordering is to consider how the Home Office's technical features introduce new efficiency tactics and, in a technically opaque manner, reinforce and replicate past migration patterns. I focus on the private actors of the *Digital* Hostile Environment that trace how the UK border is best understood via the image of a Möbius strip. Imagining the border via the Möbius continuum is used by IPS (Bigo, 2001) to consider the features of external actors furthering the security motives of the sovereign. The Möbius strip is used to reimagine the border detention logic as a "zone transversal" within a series of networks that contains "unpredictable subjectivation, micropolitics, and tactical solidarities" (Sanyal, 2019). As the role of private actors contributing to Home Office administrative technologies is clarified, so is the Möbius nature of the UK border.

In the case of Atlas, the blurriness of who fixes the data errors is outsourced to the private contractors, Cognizant, and Deloitte; when issues arise for individuals accessing their immigration status, there is a blurred boundary of who is responsible. The metaphor of the

Möbius strip is critical to understanding the relation of technologies emerging into infrastructure which constructs the future. Along the Möbius strip, there are the racialised populations in the UK who, through weaponised data sharing, are at risk of falling along the continuum of an outsider. Grounded in the work of Yuval-Davis (2018), constructing the internal through "everyday bordering" recreates racialised social orders. I use the metaphor of the Möbius strip to illustrate how the power of controlling the internal border operates. This metaphor conceptualises how the internal control logics — the technology implemented to maintain the construction of the "insider" — impacts power both inside and outside the boundaries of the UK. As established, the NHS became a codified border control officer via the MoU with the Home Office in 2017; this action could be plotted cartographically internally in the UK. However, an external actor, Palantir, travels through the infrastructure of how the data of the once internally plotted NHS border actor is conducted. I examine the infrastructure built to perpetuate the Hostile Environment, and a similar pattern of exporting to American technology companies emerges. The continuation of contracts with American companies to build, manage and visualise the UK border demonstrates how tangibly technologies are working to reinforce the same hostility of rooting out the notion of the "illegal" person. In the same tangent of the Möbius strip, there is work to understand how technology implemented internally works to create the inside order via racialisation politics.

The Streaming Tool's function fits into the metaphor of a Möbius border. The algorithm projected border controls to reject or accept certain mobilities based on the risk each applicant posed. Embedded into the Tool's technical infrastructure is the use of nationality as a *direct* input. Both the projection of the border via algorithmic means and the technically opaque redesign of the Streaming Tool reveals the blurred nature of a system directing migration decisions. From the understanding that the Home Office management and migration assessment is informed by biassed tools, the Sham Marriage Tool's power to internally control the relationship between UK citizens and non-citizens plots the tool along the internal plane of the strip. The tool's infrastructure rests under the umbrella of internally produced by the Home Office; however, there is a proliferation of private actors in the department's makeup. Finally, the ongoing project of Atlas as a technology is the visual portal for all Home Officer workers to manage their internal processing of migration governance. Still, there is a continuation of the pattern of relying on private actors.

The logic of the Streaming Tool and the Sham Marriage algorithm are the technologically reinforced racialised outcomes. The Sham Marriage tool demonstrates patterns of the racialisation of the EU migrant (Blachnicka-Ciacek & Budginaite-Mackine, 2022) in the high-risk rating given to EU nationals. Informed from the case studies are the technically articulated policy imperatives of maintaining internal order in the UK through the political image of "whiteness" and "Britishness"(Anderson, 2013). The politics of the UK's internal order framing around racial purity is not new (Anderson, 2013), nor is the impact of UK society on maintaining exterior borders. I argue that what is introduced via the formation of a *Digital* Hostile Environment is an infrastructurally maintained Möbius strip that blurs the where, who and how violent exclusion is perpetrated, introducing a future in which consequences are unforeseen. In the twists and continuum of internal and external border control rests technology poised to reinforce and legitimise the politics of exclusion. The vision of the UK border through the image of the Möbius strip reiterates the consequences of the continuum of internal and external boundaries becoming increasingly fluid, as groups of people may be categorised as the other.

The defining feature of a Möbius feature is that both the viewer and the traveller do not know where they are on the boundary. Are they on the external or internal frontiers? Border technology today creates a dispersed topology of immigration checks. A visa applicant coming to the UK to attend an academic conference checks their email or mail and is thrust out of the external boundaries of the UK. Sponsors of family visit visas receive a call from their loved ones that, once again, the Home Office has rejected their application, under suspicion that they would not return to their country. The sponsor looks down, and the border curves around their ability to reconnect with family. Someone can look around a doctor's office after being asked to see their passport, scan the room, and think, am I at the border? Similarly, a couple in the UK is called in for more questions about the validity of their relationship. They may ask, where am I at the border, how am I being seen? Technology's role in the administrative ability of the Home Office to categorise, risk assess and redraw boundaries of belonging expands our understanding of the border.

9.4 Call for Further Research

Early in my research, I was compelled to investigate the EU resettlement scheme and the errors produced for women. Due to my data feminist methodology, I wanted to explore gender-

based bias in the *Digital* Hostile Environment. My research into my three case studies had more empirical evidence to make claims on the continuation of racialised results, while gender and race are interlocking and give context to one another I focus on the continuation of racially discriminatory results (Razack, 2008, p. 60). The Streaming and Sham Marriage algorithms both have documented racialised outcomes resulting from the use of an automated decision-making system. Atlas builds on the section of the thesis that demonstrates how data failures and the push for increased automation pose the risk for failures to impact migrants. I argue that our investigation and critique of technology should not depend on codified harms. Still, we can look at the surrounding infrastructure and consider the patterns of assumptions being created. My original hypothesis on this framework for Atlas has been proven true. When we see the continuation of private actors helping make technology adaptable, dispersing the accountability for the function of the tools and reinforcing a reliance on the technology by the Home Office, we can consider how the future of bordering is considered. My inability to make claims about the gendered biases should not be taken as a rejection that research should rely on the codified discrimination outcomes, but to say that I did not have the findings to cover the aspect fully. In the consideration of the data points for the Sham Marriage tool, aspects of historical gender bias are revealed through the past practices of controlling international relationships. Questions of how digital identification systems and data sharing indirectly will contain categorisation or impact women at a disappointing rate informs how further research on the algorithmic systems discussed can be explored (Tsui, 2022). We get hints of the tendency to trust and validate the knowledge produced by technology as neutral, biassed, and accurate through the techno-solutionist pattern of the Home Office. Beyond the lack of empirical evidence on gender-based discrimination, my research does not include direct data on migrant experiences.

My lack of empirical data on the experience of visa holders is another limitation of my work. My work speaks to how the Home Office administrative practice, technology and governance interact, yet besides anecdotal comments on my own visa experiences, there are no narratives from migrants. As I justify in Chapter Three, the technology I explore in the case studies often occurs without the overt knowledge of migrants. My hypothesis that informing migrant participants about the use of automated decisions on their visa application may cause harm was proven correct after my interview with PLP. The couples who came forward after the public inquiry into the Sham Marriage algorithm from PLP did not know there was an

algorithmic system behind the further discussion of their relationship. My interview participant from PLP said that the knowledge that there was an algorithmic system that may have contributed to their trouble obtaining marriage permission reignited "painful memories" (M. Leslie, personal communication, 21 March 2023). As my methods are informed by the data feminist principles, I seek to conduct research in a non-extractive manner. I would encourage further research that could ethically capture migrant voices and their experience with data collection and the expansion of the *Digital* Hostile Environment. One means that this could be about the intersection of technology, higher education, and the Home Office, which are creating a new privatised regime of managing international students. My work reveals the bias, and the future of bordering practices enshrined in the technical infrastructure but does little to offer solutions or other futures.

One avenue that my research introduces is a more digital interpretation that can speak to how we would build better technology. What does ethical technology mean in the context of borders? My research concludes with an exploration of the contagion of private actors, specifically Palantir, to consider if the *Digital* Hostile Environment has become Americanised. Further work into the plethora of American companies providing the backbone of the digital system used by the Home Office and other UK public authorities is necessary. Work on this subject can build on my findings on the socio-technical features of the algorithms to consider a more socio-digital imaginary (Villa-Nicholas, 2023). I engage in the last chapter and in the incorporation of resistance to the *Digital* Hostile Environment by activist groups to show the narrative of bordering procedures is non-linear. My statement that the technical infrastructure is poised to replicate and reinforce past migration decisions is not to suggest that this process is ironclad. My work aims to make visible the technical features, private actors, and contagion of border procedures and to inspire further investigation into the administrative features of UK bordering. As I expose how the perpetuation of hostility, exclusionary devices of control and chaos has been exported into the administrative technologies of the UK, the definition and scope of the *Digital* Hostile Environment has expanded.

My research has identified how the algorithms, databases and use of private actors contribute to further spreading the infrastructure of the *Digital* Hostile Environment. Infrastructure as a lens is crucial for my current work to identify how the future of the UK's bordering practices may occur. As the UK pushes for a fully digital border by 2025 (Central

Digital and Data Office, 2022), the question of who is building, maintaining, and designing the systems is a crucial political question. Equally, the question of how different populations, communities, and people will be caught up in the Möbius border remains. From my identification of the networked and technically adaptable nature of the administrative technologies of the Home Office, we have a clearer picture of the management of migration in the UK. From the first step of applying, settling and accessing visa information, automation lurks and shapes the function of the UK border. Behind the Home Office rhetoric, of shifting to a compliance Environment or improving migration governance via technological systems, remains the *Digital* Hostile Environment.

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