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To cite this article: Georgios Glouftsios & Stephan Scheel (2020): An inquiry into the digitisation of border and migration management: performativity, contestation and heterogeneous engineering, Third World Quarterly, DOI: [10.1080/01436597.2020.1807929](https://doi.org/10.1080/01436597.2020.1807929)

To link to this article: <https://doi.org/10.1080/01436597.2020.1807929>



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Published online: 01 Sep 2020.



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# An inquiry into the digitisation of border and migration management: performativity, contestation and heterogeneous engineering

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## ABSTRACT

This article is concerned with the digitisation of border security and migration management. Illustrated through an encounter between a migrant and the Visa Information System (VIS) – one of the largest migration-related biometric databases worldwide – the article's first part outlines three implications of digitisation. We argue that the VIS assembles a set of previously unconnected state authorities into a group of end users who enact border security and migration management through the gathering, processing and sharing of data; facilitates the practice of traceability, understood as a rationality of mobility control; and has restrictive effects on migrants' capacity to manoeuvre and resist control. Given these implications, the article's second part introduces three analytical sensitivities that help to avoid some analytical traps when studying digitisation processes. These sensitivities take their cue from insights and concepts in science and technology studies (STS), specifically material semiotics/Actor Network Theory (ANT) approaches. They concern, firstly, the ways that data-based security practices perform the identities of the individuals that they target; secondly, the need to consider possible practices of subversion by migrants to avoid control-biased analyses; and finally, the challenge to study the design and development of border security technologies without falling into either technological or socio-political determinism.

## ARTICLE HISTORY

Received 13 December 2019

Accepted 3 August 2020

## KEYWORDS

biometrics  
borders  
migration management  
mobility control  
science and technology studies (STS)  
Visa Information System (VIS)

## Introduction

Since the early 2000s, we have observed a proliferation of digital technologies in the field of border security and migration management. Examples include a vast array of databases recording the comings, goings and doings of travellers and migrants, often coupled with biometric recognition systems, the use of drones and satellites to monitor border zones, pre-departure checks facilitated by algorithmic risk-profiling or the capture and analysis of social media and mobile phone data to determine the identity and country of origin of

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illegalised migrants and asylum seekers. In this article, we pursue – in line with the themes covered by this Special Issue on New Actors and Contested Architectures of Global Migration Governance (Van Riemsdijk et al. forthcoming) – two aims and related research questions concerning the digitisation of border security and migration management. First, we explain what digitisation entails in practice, and why it is important to take it seriously. Second, we address the follow-up question: what kind of concepts and analytical sensitivities might allow scholars to study and account for the practices, technical details, operational logics and power dynamics implicated in processes of digitisation? To this end, we elaborate a conceptual toolkit inspired by science and technology studies (STS), demonstrate its usefulness for scholars in border, migration and critical security studies wishing to study processes of digital (re)bordering, and thus propose a conceptual–methodological framework and some avenues for future research.

In this way, we seek to contribute to a growing, transdisciplinary body of literature that explores how digital technologies reconfigure the rationales, techniques and practices of border security and migration management. Previous research demonstrates that digitisation is intrinsically linked to the rise of pre-emptive, discriminatory logics of control that call for the anticipation and pro-active addressing of ‘risks’ associated with international mobility (eg Amoore 2009; Den Boer and Van Buuren 2012; Leese 2014). In this context, scholars observe that digitisation lies at the heart of attempts to ‘filter’ (Walters 2006) international mobility and ‘ban’ (Bigo 2008) racialised, (in)securitised subjects, while ‘facilitating’ (Leese 2016; Scheel 2013; Sontowski 2018) the circulation of those ‘kinetic elites’ (Adey 2006) expected to generate financial and other kinds of capital (eg businesspeople, affluent tourists, academics). Scholars also expose how digitisation destabilises traditional understandings of borders as rigid, immobile territorial frontiers. For example, Dennis Broeders and James Hampshire (Broeders and Hampshire 2013) show that information and communications technologies (ICTs) imply the performative multiplication and spatiotemporal dispersion of borders beyond geopolitical demarcation lines (see also Bigo and Guild 2005; Glouftsiou 2018; Vaughan-Williams 2010). Huub Dijstelbloem and Broeders, in turn, diagnose the emergence of a socio-technical mode of mobility management which entails the inter-linking of dispersed control procedures ‘through policy programmes, control systems, technical devices, and [digital] information flows’ (Dijstelbloem and Broeders 2015, 23). Similarly, Rocco Bellanova and Denis Duez describe border security as a ‘dense socio-technical environment’ (Bellanova and Duez 2012, 110) produced by the practical associations of human actors and various digital technologies (see also Jeandesboz 2016; Pallister-Wilkins 2016).

Importantly, scholars observe that the digitisation of border security and migration management is not limited to the ‘usual suspects’, meaning affluent countries of the Global North that constitute destinations for (aspiring) migrants, but concerns also, and perhaps first and foremost, developing countries and their populations. While Canada, Japan, the member states of the European Union (EU) and the United States (US) were among the first to digitise border controls, similar developments have occurred in Brazil, Ghana, Indonesia, Malaysia, Senegal and the nascent nation-state of South Sudan. For example, regarding biometric recognition systems, Philippe Frowd (2017) explains that their deployment in the Global South signals an emerging ‘biometric ideal’ that promises states, besides more efficient border controls, their integration into global security arrangements (see also Jacobsen 2015). Moreover, the digitisation of border controls in the Global North targets principally people coming from the Global South. For instance, regarding the development of a whole arsenal

of migration-related biometric databases, Elspeth Guild (2009) notes that the EU member states assume the prerogative of establishing the identity of citizens from countries in the Global South as they discard the quality of passports issued by their respective state authorities. The digitisation of border controls in the Global North is an imperial project by which affluent countries seek to keep at bay the global poor in an increasingly interconnected, mobile world (Bigo 2008; Duffield 2008).

While a lot has been written about digitisation, many studies operate on a rather abstract level: there are relatively few contributions that develop situated analyses of encounters between digitised control apparatuses and the subjects that they target. We certainly recognise that such analyses are not always possible due to the 'secrecy' (De Goede, Pallister-Wilkins, and Bosma 2020) that researchers often encounter when investigating security contexts, and related problems of field access. Yet there are scholars who manage to 'infiltrate', so to speak, the workspaces of those enacting border security and migration management by digital means. Alexandra Hall (2017), for example, investigates the decision-making processes of data analysts at a European smart border targeting centre, while Stephan Scheel (2019) was able to observe the practical implementation of a biometric recognition system at consulates and airports. Martina Tazzioli (2018) has, in turn, ethnographically studied how migrant journeys in the Mediterranean Sea are made visible by the European Border Surveillance System (Eurosur).

Like these studies – in the first part of this article – we contribute to the relevant literature by developing a more in-depth, situated understanding of digitisation. We do so by discussing the encounter between Ms B, a woman from Ghana seeking to regularise her migration status in Germany, and the Visa Information System (VIS), which is the largest migration-related biometric database in the EU. Our analysis is informed by material-semiotic/Actor Network Theory (ANT) approaches (Law 2008; Mol 2010). These approaches emphasise that the 'social' is thoroughly heterogeneous: it is populated not only by human subjects but also technological artefacts – what Bruno Latour once described as the 'missing masses' (1992) – that hold it together. Rather than positing a clear-cut distinction between society and technology to think of one realm as a dependent variable of the other, material-semiotic/ANT approaches invite attention to the ways that 'socio-technical settings' (Akrich and Latour 1992, 260) – be they clinics, laboratories or large-scale infrastructures – are constituted by heterogeneous human and non-human elements, analysing both with the same methods and terms (Callon 1986). Inspired by this mode of inquiry, we present the encounter between Ms B with the VIS, and we explain that digitisation (1) allows for the *interconnection* of an array of previously largely unconnected actors enacting border controls; (2) facilitates the emergence of an operational logic of control that revolves around the *traceability* of mobile subjects; and (3) has *restrictive effects* on migrants' and border crossers' capacity to subvert control practices. We direct attention to, synthesise and provide empirical evidence on these implications to produce a more complete diagnosis of how international mobility and migration are managed by digital means.

Given these implications, the article's second part contributes to the existing literature by elaborating a conceptual-methodological framework for studying the digitisation of border security and migration management, pointing also to some emerging avenues for future research. More specifically, we introduce a set of analytical sensitivities inspired by material-semiotic/ANT approaches that help to avoid some analytical traps when investigating matters related to digitisation, and we discuss these by referring to the example of Ms B's

encounter with the VIS. The first sensitivity concerns the *performative effects* of information systems, such as the VIS, that help to produce the very subjects whose movements, whereabouts and doings they are meant to monitor, regulate and govern. Acknowledging the performative effects of information systems helps to avoid analyses that uncritically accept the objective truth that these technologies allegedly produce about the identities of people whose data they store and process. The second analytical sensitivity concerns migrants' capacity to *subvert and contest* even the most sophisticated security technologies. We contend that it is important for scholars to consider this capacity to avoid 'control-biased analyses' (Scheel 2013). Finally, the third sensitivity concerns the labour that goes into the design and development of information systems. We suggest thinking about this labour in terms of *heterogeneous engineering* (Law 1987) to avoid reductionist analyses of digitisation that prioritise either its technoscientific or its socio-political aspects.

## The encounter

### Introducing the case of Ms B

The reception centre where Stephan observed the following encounter in March 2019 is in a repurposed warehouse complex in a mixed residential-industrial area on the fringes of a German city. It was opened in summer 2016 as part of the government's response to the 'refugee crisis'. Following a decision of the German ministers of the interior, each of the German states (*Bundesländer*) must maintain at least one reception centre. Along with a range of other measures, these reception centres (*Ankunftszentren*) are meant as assurance that the perceived loss of control during the refugee crisis will not reoccur. The centre functions as an 'obligatory passage point' (Callon 1986, 205). All newly arriving migrants, including those apprehended without proper paperwork by the police, should pass through the centre before they are relocated to accommodation units across the city.

At the centre, all migrants undergo strictly formalised registration procedures before they can apply for asylum or another residence title. After a quick medical check, migrants wait on plastic chairs in a large, heavily guarded hall before they are called to one of the offices that are lined up along a corridor behind the waiting hall. The registration procedure is facilitated by various technologies and information systems, as the caseworkers' offices attest. Their large desks are not primarily populated by paper files, but heavily cramped with computer screens, fingerprints scanners and other technological devices. Many of these devices are part of the so-called 'PIK-stations', which were developed in 2016 by a consortium of engineers, programmers, Information Technology (IT) specialists and lawyers of the Federal Printing Office (*Bundesdruckerei*) and the Federal Agency for Migration and Refugees (BAMF) as part of the government's response to the refugee crisis.

The PIK-stations are meant to facilitate the swift registration of newly arriving asylum seekers, including the capture of biometric data to avoid multiple registrations of the same person. The acronym PIK stands for 'personalisation infrastructure components' (Tangermann 2017, 16). Each PIK-station includes a fingerprint scanner, a camera for capturing biometric facial images, an electronic passport reader, a scanner for any identity-supporting documents like birth or marriage certificates, and a laptop with software facilitating the registration procedure, called AKN-client. This software guides the caseworker through the procedure step by step. Before the caseworker can register a new migrant, she should double-check

that the person has not been registered before in Germany's central register of foreigners (*Ausländerzentralregister*, hereafter: AZR). The software generates a list of people with similar names and dates of birth. The caseworker should click on the suggested files and confirm that none of them corresponds to the person in front of her. Moreover, the caseworker is only able to create a new file in the AZR after all mandatory fields and steps set by the AKN-client have been completed. One step involves a mandatory check with biometric fingerprint data in various national and European databases, including the AZR, Eurodac, the Schengen Information System (SIS II), the VIS and the national German visa database. If a migrant raises the suspicion of caseworkers, for instance because the person's claimed identity or legal status conflicts with information held in a database, the person is brought to the reception centre's first floor for further interrogation.

This is what happened to Ms B on the day of my visit. When I enter the stuffy room of the foreigner's office (*Ausländerbehörde*), I am greeted by two caseworkers. They face each other, sitting at desks crowded with the technological devices described above. The caseworker (hereafter Solaria), while preparing all available evidence for the so-called interviewer (*Anhörer*, literally 'interrogator'), informs me about the case of a woman who is about to be interviewed. The woman from Ghana (hereafter Ms B) has made herself known to authorities because she wants to apply for a residence permit as she is about to give birth to a German citizen. Under section 1592 of the German Civil Code, a man can declare fatherhood for a child of a woman if she is not married and approves the proposed fatherhood. The man assuming fatherhood does not need to be the biological father of the child. If the man in question is a German citizen, the child is eligible for German citizenship. In this way, the child's mother becomes the mother of a German citizen and is eligible for a residence permit in Germany.

However, there is an issue with the paperwork that Ms B has submitted as part of her application. Ms B has not provided a passport yet. She only brought a leaflet with a scanned picture of her face which confirms that she has applied for a new passport at the Ghanaian embassy in Berlin under the name Mary B. According to the leaflet, she was supposed to pick up the passport on 25th of January – more than six weeks ago. 'This is nothing but a friendly photocopy...' mumbles the interviewer.

'What struck me, even more, is that we found a record in the visa database', continues Solaria. She points to the left computer screen on her desk. The screen shows the 'visa information sheet' that has been retrieved from the VIS with the help of Ms B's fingerprints. According to the file, Ms B applied for a visa at the German embassy in Accra about two years ago. The visa has been issued under a different name – Mavel B.

Solaris says: 'The name is different and the image of the woman [shown on the visa information sheet] looks also very different from the woman downstairs .... In any case, she insists that this is not her and that her identity is the one given in the passport for which she applied at the embassy. The thing is that she signed her application for a residence permit as Mavel B – the name used for the visa application – not Mary B .... What are we going to do with her? She is supposed to give birth in ten days.'

'That will depend on what she will tell us now. Bring her up here. She will have to explain us a few things... She might be on maternity protection, but that does not mean that we cannot ask her a few questions', advises the interviewer.

We do not have space here to provide a full account of the encounter, which continues with a tough grilling of Ms B. The interviewer confronts Ms B with a printout of the visa

information sheet and tries to persuade her to admit that the identity stated by the VIS – a married woman called Mavel B – is her. In other words, Ms B must contest the identity linked to the biometric data of her fingerprints to avoid deportation after giving birth. For, as noted in the beginning, being married precludes the possibility for another man to assume fatherhood of a woman's child because the woman's husband becomes – in legal terms – automatically the father of any of the woman's children. Unsurprisingly, Ms B insists that she is not Mavel B, and claims that the passport under this name had been given to her by smugglers before she applied for a visa at the German consulate in Accra. However, because of the hit in the VIS, Ms B must provide evidence for her claim that she is Mary B – an unmarried woman from Ghana – not Mavel B – a married woman from Ghana. A simple counterclaim is not enough in the age of digitised border and migration controls. Eventually, it is decided that Ms B should pick up the passport she allegedly applied for from the Ghanaian embassy in Berlin and present it to the foreigner's office within five working days. For the moment, the outcome of Ms B's encounter with the VIS remains undecided. If Ms B provides the passport issued by the Ghanaian embassy, she will be registered as Mary B and pursue the recognition of fatherhood by a German citizen for her unborn child. If not, Ms B will remain registered as Mavel B, a married woman from Ghana, and be subjected to deportation procedures, together with her unborn child.

### *Implications of digitisation*

The case of Ms B is exemplary of how digital data matter in border security and migration management. The information system used by the German authorities to assess the application of Ms B was the VIS. To understand how the VIS operates, it is useful to see it as a socio-technical setting that expands across the spaces where migration and border controls are enacted – such as the migration office described above – and that is constituted by a multiplicity of interacting human agents and technological artefacts. The power to govern international mobility and migration through digital means is sustained through the associations and interactions between the heterogeneous elements that make up the VIS, which functions as an infrastructural skeleton that interconnects the wider EU border security and migration management apparatus.

Regarding the system's human operating parts, the VIS brings together (a) officials working in consulates of EU member states in third countries; (b) border guards performing controls at ports of entry to the Schengen area; (c) officials working in migration administrations inside the Schengen area; and (d) police officers and internal security agencies (OJEU 2008a, 2008b). This highly dispersed, heterogeneous set of actors has already previously enacted controls on third-country nationals. What the VIS has changed – *and this is the first crucial implication of the digitisation of border security and migration management* – is that it assembles this previously largely unconnected set of actors into a group of end users who interact and coordinate their work through data sharing. Before the deployment of the VIS, the lack of interconnection between these actors was creating problems related to the implementation of the EU common visa policy. For example, information on Schengen visa applications previously recorded by the consulates of a member state was not readily available to the consular authorities of other member states. This often resulted in visa shopping, which means that third-country nationals whose applications had been previously rejected



by a national consulate were able to reapply for a Schengen visa in different consular posts without the latter being informed about already lodged applications. Even though national authorities could use a message exchange platform for bilateral communications, the whole process of information exchange was 'partial, bureaucratic, time-consuming' and could often lead to inaccuracies (EPEC 2004, 14).

The VIS was introduced as a solution to this lack of interconnection and information exchange. In the case of Ms B, the officers responsible for examining her application for residence permit consulted the VIS and retrieved the data file that had been created by the German embassy in Accra when Ms B applied for a visa under the name Mavel B. It is important to clarify that we do not understand the VIS end users as being external to the system. End users are practically enmeshed with the physical (eg biometric scanners, screens) and logical (eg algorithms, data files) artefacts that constitute the VIS (Glouftsiou 2018). In Ms B's case, this became obvious when German authorities attempted to verify her identity by scanning her fingerprints and matching these with the biometric templates already stored in the VIS.

The technological pipelines that facilitate the exchange of data between the VIS end users form the system's infrastructural architecture. At the supranational level, there is the central VIS (CS-VIS) in France and a backup system in Austria, which are managed by the EU's IT agency eu-LISA. For resilience purposes, the backup system automatically mirrors all data stored in the central VIS (OJEU 2008c). The central VIS is fed visa-related data by national systems through a shared communications network. Also, each member state has developed its own communications network that connects the premises of end users (eg consulates, border checkpoints, migration offices) to the national systems. Hence, data flow back and forth between the central European systems and the national ones.

When Ms B applied for a visa in the German embassy in Accra, a data file was created in the German visa system. The VIS data files comprise: (1) all alphanumeric data of the visa application form (eg surname, first name, sex, country of birth, etc.); (2) digitised scans of 10 fingerprints used for automatic biometric matching; and (3) a digital photograph captured according to International Civil Aviation Organization (ICAO) standards for machine-readable travel documents (OJEU 2008a). From the German system, Ms B's data file was transmitted to the CS-VIS, which then distributed it to the national visa systems of each member state. This means that the end users of all Schengen member states – from consular officials to border guards, police officers and staff working in migration administrations – were able to access the information that was initially collected, digitised and stored by the German embassy in Accra.

The functional specifications of the VIS illustrate that the build-up of biometric databases implies – *and this is the second implication of the digitisation of border and migration management* – a reconfiguration of the very rationale of mobility control, which revolves around the *traceability* of migrants and border crossers (Bonditti 2004; Scheel 2019). Philippe Bonditti (2010, 2) understands traceability as 'the capacity of security agencies to recreate geographical, social and digital trajectories of individuals, goods, capital and data'. To be sure, the logic of traceability is not entirely new. Since the Middle Ages, authorities have deployed various methods for documenting, tracking and verifying individual identities (see the contributions to Caplan and Torpey 2001). Examples include descriptions of individuals in safe-conduct papers, the use of tattoos and brandings to mark slaves and sailors, and paper-based registers which only began to be replaced by computerised information systems from the 1950s



onwards. The establishment of the modern passport system during the First World War implied a crucial shift as it allowed nation-states to 'monopolise the legitimate means of movement' (Torpey 2001, 256). While the passport system 'concentrates in itself the enormous increase' in the control of individuals and populations (Torpey 2001, 257), nation-states have primarily issued passports and ID cards to certify their citizens' legal status and to control access to (and exit from) their territories. The capacity of state authorities to actually trace the movements and bureaucratic trajectories of third-country nationals remained, in contrast, limited.

And this, we contend, changes with the digitisation of border and migration management. Information systems and identification technologies provide state authorities with a new form of 'digital power' that enables them 'to "know" subjects with unprecedented detail and confidence as well as attach a permanent identity to them' (Ansorge 2016, 7). This power resides in the capacity of information systems to store, analyse and share immense volumes of biometric and biographical data with unprecedented speed, and in the transformation of the human body into 'an indisputable anchor to which data can be safely secured' (Amoore and De Goede 2005, 163–64). The crucial point is that these digitally enhanced control capacities imply that traceability – the tracking and reconstruction of subjects' movements and bureaucratic trajectories – is pushed to the forefront, becoming the predominant rationale of contemporary border and migration management. This shift is well reflected in the objectives of the VIS, which include to forestall visa shopping (by tracing the previous visa applications of third-country nationals at consular posts); to assist in the implementation of the Dublin Regulation (by enabling migration administrations to determine whether an asylum seeker has entered the Schengen area with a visa issued by a member state, which thereby becomes responsible for processing the person's asylum claim); and to facilitate the deportation of visa overstayers (by allowing authorities to determine the person's country of origin and identity used in the visa application) (see OJEU 2008a).

The chain of controls mediated by the VIS starts at one of the 3500 consular posts that the Schengen member states maintain worldwide, such as the German embassy in Accra where Ms B applied for a visa. At consular posts, authorities capture the biometric data of all visa applicants, together with comprehensive biographical data inferred from passports and the visa application form. Through this step of 'enrolment' in the database, authorities establish the traceability of visa applicants (and visa holders), who can now be re-identified through their fingerprints. The powerful effects of this rationale of traceability can be already observed in consulates where staff conduct searches in the VIS to detect instances of visa shopping. Whereas visa applicants could previously conceal the stamps that consular staff insert in their passports to highlight a rejected visa application and try their luck with a new passport, authorities can now check in the VIS by means of biometric data 'if this fingerprint has already applied for a visa', as a senior border guard summarises the logic of traceability underpinning the VIS (see Scheel 2019, 62–64).

Beyond consulates, the VIS mediates the security labour of border guards and police officers who enact controls either at border crossing points or inside the Schengen area. For example, by taking advantage of the VIS biometric matching functionality, border guards can verify whether the person seeking to enter the EU Schengen area is the same person to whom the visa has been issued by scanning her/his fingertips and comparing these with

already existing data files (see Scheel 2019, 157–181). Similarly, police officers and relevant state bureaucracies can re-identify undocumented individuals who have entered the Schengen area legally but have overstayed their visas, destroyed their passports or produced fake ones to avoid identification and capture.

What these examples highlight is that biometric databases imply a shift from border to body controls (Rygiel 2011). The bodies of travellers and migrants become not only the primary targets but also the principal means of a mode of control that renders them re-identifiable *and* traceable. This mode of governing mobility through traceability relies on digitised scans of purportedly unique and immutable corporeal features, such as fingerprints. Biometric, biographical and other alphanumeric data are merged into a ‘digital alter ego’ (Amoore 2009, 18) that refers to the individual concerned. In the case of Ms B, her digital alter ego was Mavel B who, according to the VIS, was the same person as Ms B, since the biometrics enrolled by Ms B at the German foreigner’s office matched the biometric template that has been already stored in the system by the German consulate in Accra. In this way, biometric databases turn the body of an individual into a witness for or against herself, so that migrants are haunted by their alter egos as they become targets of digitally mediated control practices.

Hence, the case of Ms B also illustrates the *third implication of the digitisation of border and migration management* – namely, the restrictive effects that digital technologies have on migrants’ capacity to negotiate controls. The reason is that biometric databases not only render mobile individuals traceable and re-identifiable: they also allow authorities to synchronise controls and resulting sanctions. Information on visa applicants which was previously scattered over the countless folders of consular posts maintained by EU member states worldwide becomes available *and* accessible within seconds. The digitisation of border and migration management permits the foreclosure of previously successful practices of subversion and contestation (see Scheel 2019, 63–64). Since the VIS began operating, it takes consular staff only a few seconds to check whether an applicant has been refused a visa and, if so, reject her application. Also, as the case of Ms B illustrates, it is no longer possible for migrants to simply conceal or reinvent their identities by destroying previously used ID papers. If their fingerprints are stored in the VIS, it takes authorities only a few hours to establish their identities and countries of origin. Thus, information systems like the VIS not only imply a qualitative shift in the rationale and efficiency of border controls, but also significantly alter the power relations between migrants and state authorities (Scheel 2013), by rendering migrants’ bodies ‘machine-readable’ (Van Der Ploeg 2012).

### Analytical sensitivities

So far, we have explained that it is important to take the digitisation of border and migration management seriously because it (1) merges a set of previously largely unconnected actors into a group of end users coordinating their work through data-exchange; (2) facilitates the practical enactment of traceability as a rationality of mobility control; (3) alters the power relations between authorities and mobile individuals to the advantage of the former. Given these implications of digitisation, we now highlight three analytical sensitivities inspired by

material-semiotic/ANT approaches. These are important for future research on digitisation as they help to avoid certain analytical traps.

### *Performativity*

The first sensitivity concerns the performative effects of information systems like the VIS. More specifically, we want to sensitise scholars towards the ways that the ontologies of mobile bodies (ie the meanings and identities attached to them) are *performed* by control practices enacted through digital means. Our understanding of performativity is inspired by the works of Annemarie Mol (2002) and Karen Barad (2007). For Mol and Barad, performativity refers to the idea that the ontologies of bodies and phenomena are not pre-given and fixed, but reiteratively produced through knowledge practices. Their understanding of performativity stands in stark contrast to representationalist, positivist and anthropocentric understandings of scientific knowledge production, according to which the representations generated by knowing subjects through various types of measurements and calculations objectively reveal the 'truth' of bodies and phenomena under scientific observation. In their studies, Mol and Barad demonstrate that the realities of bodies and entities are performed by associations of human actors (ie scientists) and non-human entities (ie laboratory equipment) enmeshed in knowledge practices. They suggest that knowledge-making practices are always technically mediated and, instead of merely representing, bring into being the realities they engage with. This argument does not refer to a kind of philosophical idealism, according to which everything can be performed in practice (Law 2009, 243). The successful production of a particular reality is always an accomplishment, which depends on power contestations, controversies and the credibility assembled (Aradau and Huysmans 2019) by those who perform different – and often conflicting – versions of that reality. Such power relations and controversies reflect what Mol (2002) describes as 'ontological politics', which means that realities can be challenged and performed in alternative ways, a point to which we return in the next section.

Inspired by these ideas, we want to invite analyses that explore how the identities of bodies – travellers, migrants, refugees – are performed by digitally mediated control practices. Such practices are essentially 'data practices' (Scheel, Ruppert, and Ustek-Spilda 2019), ie socio-technical practices revolving around the production, analysis and circulation of data. As explained before, these practices are enacted by heterogeneous ensembles of human actors and digital technologies. For example, by scanning and algorithmically processing the fingerprints of Ms B, caseworkers at the German foreigner's office found a matching data file in the VIS. According to that file, Ms B has previously applied for a visa as Mavel B at the German embassy in Accra. Ms B insisted nevertheless that she was Mary B, claiming she had applied for the visa under a different identity with a passport given to her by smugglers. This means that the identity performed by the data retrieved from the VIS was different from the identity claimed by Ms B. The performative production of Ms B's identity as Mavel B is a matter of power and technical mediation. Confronted with the high-tech instruments of German authorities, it was difficult for Ms B to escape this digital alter ego of Mavel B, which was biometrically ascribed to her body. During the identity controversy between Ms B and German authorities, the source of credibility that Ms B mobilised was a leaflet confirming that she had applied for a passport under the name Mary B, while authorities used fingerprint

scanners, biometric matching algorithms, the long history of fingerprints as strong evidence in criminal proceedings and the VIS data file to 'prove' – and thus perform – the identity of Ms B as Mavel B. To contest this VIS-substantiated identity and successfully perform herself as Mary B, Ms B has to provide material evidence for her counterclaim: she should present to caseworkers the new passport under the name of Mary B for which she allegedly applied at the Ghanaian embassy.

In the context of the VIS, migrants and border crossers are iteratively performed as suspect or trusted bodies – and treated as such – through the digital capture, tinkering and exchange of multiple biometric and alphanumeric data fragments (Glouftsiou 2018). Data fragments are (re)assembled in consulates when third-country nationals apply for Schengen visas and get registered in the VIS. Through this initial gathering and processing of visa data, digital alter egos (Amoore 2009) of visa applicants are produced – alter egos that have a direct impact on the mobility and life chances of their human counterparts. As Irma Van Der Ploeg (2012) argues, the introduction of digital technologies, and especially biometrics, signifies the emergence of a new body ontology. Bodies are defined in terms of digital data: they become informational bodies, 'amenable to forms of analysis and categorisation not possible before, categorisations that have concrete consequences for the immediate future of the people concerned' (Van Der Ploeg 2012, 177). Such performative, socio-technical data practices should not be thought of as revealing individuals' identities objectively. Biometric technologies are prone to error and can fail in verifying identities. These failures are generated by technical affordances and malfunctions, practices of contestation (see Scheel 2019), and racial, gender and class biases inherent to biometric recognition schemes (see Magnet 2011; Pugliese 2007). This means 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.

### **Subversion and contestation**

The second analytical sensitivity we call for concerns migrants' practices of contestation and subversion that challenge digitally mediated border and migration controls. As explained above, the digitisation of controls reduces migrants' room for manoeuvre. The VIS forecloses some of the practices by which aspiring migrants could previously appropriate Schengen visas. It is, for instance, no longer possible to hand on passports with a valid Schengen visa to a so-called lookalike. If the persons' fingerprints are not stored in the VIS, the person concerned will most likely be refused entry upon arrival at the external borders of Schengen. However, this does not imply that migrants' practices of contestation have become a negligible factor that can be ignored in the analysis. To do so would result in a *control-biased analysis* that, by focusing only on the means and methods of control, misrepresents digitised border security settings, like the VIS, as omnipotent control apparatuses that allow the perfect regulation of human mobility (see Scheel 2013). Control-biased analyses are analytically flawed because they overrate the efficiency of high-tech controls. Moreover, control-biased analyses are politically highly problematic as they involuntarily confirm the claims of security professionals that innovative surveillance and

identification technologies like biometrics can guarantee watertight controls in times of unprecedented volumes of human mobility.

To avoid control-biased analyses, we suggest understanding the targets of controls as indispensable elements of the socio-technical settings designed for the management of their mobility. Instead of construing them as external to these settings, we regard migrants, asylum seekers and travellers as – even if involuntary – participants in the socio-technical settings that monitor, trace and regulate their journeys and bureaucratic trajectories. The reason is that the data which are produced and exchanged about them are not simply captured from them. Rather, these data are co-produced.

In the case of the VIS, visa applicants are not only requested to provide their biometric data. They also must complete the visa application form and provide numerous documents supporting the information provided. These documents include birth and marriage certificates, bank statements, social security records, job contracts, and so forth. They are meant to confirm the applicants' claimed economic situation and their social ties to the country of origin. The important point is that these documents are requested by the consulate, but they are provided by visa applicants. Likewise, applicants must answer all questions raised by consular staff in a mandatory interview. Again, the questions are asked by consular staff, but visa applicants provide the answers. It is due to this distribution of the capacity to act that migrants and travellers can repurpose the devices and methods of control into means allowing for the appropriation of mobility to and residency in Europe.

This is also illustrated by the case of Ms B who is performed as Mavel B. The pregnant Ms B should contest this biometrically certified identity to register her soon-to-be-born child as a German citizen and legalise her status. And this is precisely what Ms B did during her interrogation at the foreigner's office: she refuted the identity of Mavel B by claiming that the passport used for the visa application in Accra was not hers but had been given to her by a smuggler. Once in Germany, Ms B had to return this passport.

However, a simple counterclaim is not sufficient to contest a biometrically certified identity. The latter is regarded as strong evidence because it relies on what John Law (2009) calls a *hinterland*: a vast web of sedimented practices and technological artefacts that give credibility to related truth claims. To successfully contest the biometrically certified identity of Mavel B, Ms B has to 'assemble credibility' (Aradau and Huysmans 2019) for her counterclaim by establishing a competing hinterland of practices and artefacts supporting her claimed identity of Mary B. First and foremost, she has to pick up the new passport, for which she apparently applied at the Ghanaian embassy in Berlin, and to present it to caseworkers at the foreigner's office. She should also dispense with any contradictory actions, such as continuing to sign documents with the signature of Mavel B – the identity under which she lived in Germany for over a year.

The contestability of biometrically ascertained identities also pertains to the stage of enrolment. At the consulates, aspiring migrants can, for instance, manipulate the requested supporting documents in such a way that they meet the perceived criteria to be granted a visa. If an exceptionally high income and a permanent job are, for instance, informal perquisites for being granted a Schengen visa, aspiring migrants who lack these assets might ask a friend with a company to hire them on paper to provide so-called 'vraix faux' (real fakes). This type of manipulated supporting documents is nearly impossible to detect as these documents are, essentially, originals whose only sign of manipulation is that they are supporting a fictive biography (Scheel 2019, 143–148). The fact that this play with identities is

still possible in the context of the VIS shows that identity remains a 'battleground' (Groebner 2004, 182) within digitised border security regimes. Instead of erasing practices of contestation and subversion from the picture, we therefore recommend scholars consider the targets of regulation and control as indispensable elements of the socio-technical settings and situations they want to study.

### *Heterogeneous engineering*

The last analytical sensitivity we discuss concerns the design and development labour that goes into the engineering of information systems (see Glouftisios 2019; Sontowski 2018) and other digital devices used for border and migration controls (see Bourne, Johnson, and Lisle 2015; Valkenburg and Van Der Ploeg 2015). Attending to technology design and development is important for two reasons. First, it allows us to understand the concerns, rationales, controversies and assumptions translated into the functionalities of systems like the VIS. Second, it brings into focus the actors that produce and sustain the capacity to govern international mobility and migration by digital means. Those responsible for the production of digitised borders, the dystopian biometrification of migrant bodies, and their inhumane banishment on the basis of purportedly neutral algorithmic analyses are not only those actors who enact controls through information systems on the street level of policy implementation. Also responsible are the politicians, legislators, IT experts, technocrats and big tech companies that design, develop and promote these technologies. The operational logics and practices that rendered Ms B's body machine-readable and traceable were inscribed into the functionalities of the VIS long before its deployment: at the time when it was designed and developed. It is the very functionalities of the VIS – the enrolment of biometric and alphanumeric data, the automated fingerprint matching service, etc. – that enable the digital reconfiguration of control practices targeting mobile subjects. These functionalities did not appear out of the blue; they were carefully designed and built into the VIS.

We suggest that it is useful to see technology design and development process as 'heterogeneous engineering'. John Law (1987) introduced this concept to emphasise that technologists engage in synthesising exercises through which they attempt to fit together diverse kinds of technical, social, economic and political forces, interests and materials which, in turn, affect the successful development and deployment of their products. As Donald MacKenzie puts it: 'successful engineers know that to be successful they need to engineer more than metal and equations. A technological enterprise is simultaneously a social, an economic, and a political enterprise. Successful engineering is heterogeneous engineering' (Mackenzie 1990, 192). Thinking about digitisation processes in terms of heterogeneous engineering permits researchers to avoid the analytical traps related to technological and socio-political determinisms (see Bijker 2010; Mackenzie and Wajcman 1999).

Technological determinism suggests that (1) technology develops in an autonomous 'scientific' fashion independently from social, political and economic forces; (2) technological developments are the main drivers of socio-political change; and (3) lay people are unable to critique, intervene and potentially disrupt evolutionary processes of technological change. Technological determinism is problematic because it deprives the analyst of the capacity to critique processes of technology-in-the-making by, for example, unearthing anachronistic and contestable ideas informing the 'science' of biometrics. The latter neglects the socially constructed nature of identity, assuming that complex social relationships and situated



knowledges can be condensed in digital scans of allegedly objectively measurable corporeal features (Magnet 2011).

Socio-political determinism refers, in turn, to analyses of technological change that focus primarily on social dynamics and policy-related imperatives. In this case, technological change is seen as dependent upon the interests of social groups (eg policymakers, stakeholders, legislators) that support (or not) the introduction of a specific new technology. Also, technoscience is portrayed as exogenous to politics and society because innovators are seen as incapable of affecting the interests of social groups supporting or opposing their products. To limit analyses of digitisation by focusing exclusively on factors 'external' to technoscience, such as security-related concerns and policymaking processes, is a problematic reduction that hinders critical inquiries into, for instance, the notorious interests and marketing strategies of security industries that promote their products in the policy field (Baird 2017).

Thinking in terms of heterogeneous engineering allows us to understand how technoscientific and socio-political dynamics, interests and imaginaries are moulded together in technology design and development processes. The VIS was, for instance, designed and developed by a group of actors constituted by technoscientists, major consulting and computing companies, EU bureaucrats, legislators and high-ranked representatives of end-user communities (see Glouftsiος 2019). These actors gathered, synthesised, analysed and negotiated upon diverse kinds of knowledges (eg security, legal, technoscientific), interests (eg financial, political) and concerns (eg how to effectively manage migration, how to render the system resilient). In addition, they were concerned not just with the technicalities of the VIS, but also the ways that its functionalities would transform the work practices of its end users and help deal with tactics employed by migrants to contest controls. The functionalities of the VIS can, in fact, be read as recuperated forms of some of the tactics through which migrants previously successfully appropriated Schengen visas to enter and stay in the EU (see Scheel 2018). Thus, technology design and development processes are not purely technoscientific. They are heterogeneous, and we, as social scientists, should care about them because they have significant political implications. Design and development processes produce the technologies that allow for the management of international mobility and migration through the biometric encoding of individuals which, in turn, permits their traceability and shapes the conditions for tactics of subversion employed to challenge datafied methods of control.

## Conclusion

In this article, we have showcased the analytical surplus value of STS-inspired, situated analyses of encounters between socio-technical settings of mobility control and the subjects that they target, such as the encounter between of Ms B with the VIS. Situated analyses of such encounters are important because they allow for a more in-depth understanding of how international mobility and migration are managed through the gathering, processing and sharing of data. These data, and the technologies that allow for their production and circulation, are highly political because they inform and shape decision-making practices at borders and other sites where state authorities enact controls on mobile subjects. To study, expose and critique digital technologies and datafied methods of control is indeed of paramount importance, not least due to the injustices and inequalities they may generate.

To develop such situated analyses, we suggest that scholars have much to gain by drawing on insights from material-semiotic/ANT approaches. These approaches introduce a conceptual vocabulary which is useful to describe the socio-technical complexity, messiness and heterogeneity of various micro and macro empirical contexts, such as the migration office where Ms B's application for a residence permit was processed, or the expanding setting of the VIS. Attending symmetrically to the human and technological elements that make up such empirical contexts, cases and encounters is important to understand how the power to manage international mobility and migration is sustained. Digital technologies interconnect authorities enacting mobility controls and render subjects on the move traceable and re-identifiable, while at the same time limiting their capacity to evade control. In our view, material-semiotic/ANT approaches offer also signposts of a research agenda that focuses on the political moments of the digitisation of border security and migration management. In effect, each of the concepts advanced in this article points to a distinct form of politics beyond institutionalised forms of policymaking.

Indeed, the notion of performativity alerts scholars to the 'ontological politics' linked to information systems and data practices that do not represent mobile subjects more or less accurately, but actually produce them in particular ways. Embracing performativity is important to retain the capacity to critique the data-realism according to which data held about migrants objectively reveal their 'true' identities and intentions. In turn, paying attention to migrants' practices of subversion allows scholars to avoid control-biased analyses that, by solely focusing on the means and methods of control, involuntarily confirm the claims driving their implementation in the first place. A focus on these 'politics of contestation' also permits scholars to account for those moments at which migrants constitute themselves as political subjects by appropriating mobility and other resources which digital means of control are meant to deny them. Finally, a consideration of the 'politics of design and development' implied in the heterogeneous engineering of border security technologies allows scholars to expose the controversies, interests and security imaginaries that shape their implementation. This is necessary to bring to the fore the often forgotten heterogeneous engineers who, by building new technological artefacts and infrastructures, act – similarly to street-level bureaucrats – as veritable 'back-office policy-makers' (Ustek-Spilda 2020), reconfiguring the ways in which border security and migration management are practised.

## Acknowledgements

We would like to thank three anonymous reviewers for their engagement with our text and their constructive comments. We would also like to thank the editors of the special issue as well as the participants of the author's workshop at the Centre for Global Cooperation Research of the University-Duisburg-Essen, where a first draft of this paper was discussed. Finally, we would like to extend our gratitude to Anna Casaglia and Huub Dijstelbloem for the comments they provided on an earlier draft which was presented during the SGRI conference at the University of Trento.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## Funding

This study was partially funded by the University of Trento, School of International Studies (Project: Science, Technology and International Relations - STERI).

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