# "I Don't Know if It Wanted Me to Dance". On Leading and Being Led in Human-eGate Interaction

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**Abstract**
Automated border controls, such as eGates, have become an everyday experience when travelling. Other than their divisive nature as a biometrical border, these access control systems are generally either taken for granted when functioning smoothly, or are seen as forcing humans into a scripted sequence of actions. Based on a technographic study of laboratory eGate-testing in Germany, we argue for a different approach in understanding this specific human-machine interaction. Drawing on Pickering's (2012) "dance of agency", we will show that the reciprocal interaction of using an eGate comprises facets of routine, anticipation, and mimicry. By becoming more attuned to the oscillation of agency, where leading and being led is reciprocal, we must recognize that even automated systems rely on human beings, their bodies and their senses to make adjustments. Our analysis suggests that both entities are interwoven in an asymmetric way, providing a new perspective on border technologies that incorporates usability and STS-perspectives. In doing so, our (laboratory) testing demonstrates that it is possible to return and retain human agency within interactions with border technologies.

**Keywords**
eGates; automation; usability; human-machine interaction; dance of agency.

## 1. Introduction

> I don't know if it wanted me to dance. But [laughs] [...] It already said very clearly, "okay you're not where you're supposed to be right now, so please move [...] again more precisely"[1]. (User 9)

Contemporary border control systems are in a constant process of reinvention, and automation, as with the case of eGates, is central to this. Even as the latest models of eGates are installed, newer versions are being evaluated in the laboratory. This focus on a search for solutions, rather than gaining knowledge, can be understood as a type of "tinkering" in the laboratory, as Karin Knorr (1979) coined it.

Generally speaking, eGates are seen as a solution that allows for the fast channelling of ever-increasing numbers of people in the border context. They should accelerate a process that was formerly undertaken by human border guards: optimising a prevailing filtering function, and separating trusted from less-trusted travellers (see Adey 2008). Whether they actually speed up bordering processing has been challenged by scholars, highlighting that automation and the development of a "self-service border" has met with a degree of resistance (Sontowski 2018, 2741; see also Leese and Pollozek 2023).

Our article follows the logic of looking at the micropractice of border technologies and sheds light on the specific human-machine interaction within the testing of eGates. Based on a technographic[2] study in an eGate laboratory, the article focuses on the human testers' experience of the system, an example of which can be seen in the introductory quote. With its metaphorical reference to dance, it exemplifies some of the key ambiguities in the human-machine relationship on a semantic level, an issue that can be understood as a reflection of an (in-)adequate reading of a technically designed interface. On an ontological level, however, it refers to what Andrew Pickering (2012) called the "dance of agency".

When focusing on the micro-practice of automated access control systems, eGates are either mistakenly taken for granted as "smoothly functioning", as Simon Sontowski (2018, 2731) emphasises, or seen as forcing humans into a scripted sequence of actions, as Dominique Linhardt (2000) extrapolated in his study of access controls at airports. This is congruent with the classic view of Michalis Lianos and Mary Douglas (2000), who characterised automated processes as impossible to "negotiate" with (Lianos and Douglas 2000, 264), something which has a clear impact on human-machine interaction. Since 2000, automation, digitization, and different generations of biometrics have permanently changed the field of border control, a topic which has been scrutinised by a broad field of scholars within the nexus of STS, migration and border studies, and critical security and surveillance studies. Border technologies have therefore previously been looked upon either for what (kind of border policy) they represent, or for how successfully the technologies achieve these objectives.

Technologies can therefore be seen, just like the border per se, as reflecting what Paul Trauttmansdorff defines as an "epistemic prism for analysing power transformations and dynamics" (2022, 135). As such, they are manifestations of a border regime, a subject which has been highlighted with varying emphasis. Previous works have dealt with matters such as analysing the increasing role of data (Amoore 2006; Glouftsios and Leese 2023; Leese and Pollozek 2023), changing biometrical systems (Sutrop and Laas-Mikko 2012), how border technologies (and their infrastructure) render the body knowable (van der Ploeg 2003; Casartelli 2021), the rationales of the border's (social) filtering function (Lyon 2009; Adey 2008), and the securitising of mobility (Salter 2013). As for eGates, Louise Amoore (2013, 163) characterises automated (algorithmic) security decisions as "no longer a decision as such, but only the application of a body of knowledge". With this emphasis on the mere application of knowledge followed by Amoore's (2021) analysis of the machine learning procedures that entail the "deep border", the focus turns to new forms of technological inscriptions that prevail in the field.

The envisioned practical task of the eGate system is to verify that the presented form of identification matches the person currently holding the document. In doing so, the eGate

filters travellers into verified persons, who are allowed through the access control, and those whose identities are unverified, and are thus denied access. Even though the practical use of eGates has previously been studied (see Sontowski 2018; Noori 2022), the question of agency within this specific human-machine interaction has been largely overlooked.

Our study approaches eGates solely as a technological artefact, thus leaving the representations of the so-called "smart border"[3] and the analysis of "sovereign bordering" within the laboratory (Bourne et al. 2015) aside. Instead, we focus on the – to our knowledge – neglected process of how people actually interact with eGates, asking if there might be a way to look at the human-machine interaction at play, besides that of a non-negotiable force of technology on the human user. We argue that what Lianos and Douglas (2000) frame as non-negotiation can today be characterised as an oscillation of agency in light of new interactive constellations. To do so, we begin by elaborating on the usability of eGates within the laboratory, as this is the predominant methodology in this field. After introducing an analytical lens of seeing the interaction as a "dance of agency", we will highlight the three key aspects of our empirical study. Firstly, we will show that comprehension of the intuitive use of an eGate cannot be understood as a characteristic of the technical object, but can instead be viewed as a routine that users achieve by tuning their behaviour to the system. As this tuning encompasses waiting, we will secondly show that much of the waiting within the eGate interaction can be understood as a form of what Sloterdijk calls "passivity competence" (2009, 591). Finally, we will illustrate that the reciprocal process of passing an eGate can be understood as highly mimeomorphic. This leads us to a new reading of eGate-human interaction, which might point to a call for a more systematic engagement in the research of in situ interactions. We therefore suggest that human agency is key to moments of engagement with, influence in, and creation of technology that, at first glance, leaves no room for negotiation.

## 2. Methodological framework

A key feature of the technical demands eGates place on their users is a standardised procedure that is predefined by the device's composite components, including several physical barriers, a document reader, biometrics capture devices and user interfaces (like monitors or LED signals). Their specific design is based on developers' assumptions about future users, particularly their sensory, acting and cognitive capabilities and limitations (Lang 2002, 3). In order to enable smooth communication, interfaces should therefore not only allow uncomplicated handling, but also intuitive use, an important attribute of interactive systems. Although research draws on (potential) users' expectations and desires, studies on the usability of eGates mostly attribute problems to the users themselves, primarily by showing that they are "struggling with the system" (Ylikauppila et al. 2014, 170). They refer to knowledge deficits, which are mainly attributed to a lack of familiarity with the system. In contrast, the eGate is expected to work at a "precise method of operation" (*ibid.*) that guides users. Usability research on eGates has thus far largely asked whether users are able to follow the systems' directions, overlooking what actually happens at the interactional level.

An STS perspective is therefore able to fruitfully step in where prior research on usability

stops. By drawing on Madeleine Akrich (1997, 207), the reconstruction of the inscription and de-scription of artefacts allows "new forms and orders of causality" to be described. EGates are inscribed with a vision (the "inside" of technology) of working easily, efficiently and in an intuitive manner. This vision leads to a specific script ("the outside" of technology), that is supposed to organise users' behaviour. Although the script is "a major element for interpreting interaction between the object and its users" (Akrich 1997, 216), it remains open to adjustments as to how this inscribed notion is "de-scripted" (*ibid.*, 209) by the actual user. On a methodological level this involves following both the user and designer/developer, with two specific objectives: to shed a light on the black box of the scientific process; and to point to the way in which users "matter", as emphasised by Nelly Oudshoorn and Trevor Pinch (2003). To make sense of this interaction, we must address two levels of thought: the first is the attempt to conceptualise the literal communication between the user and the system, together with its design background; the second, meanwhile, lies at the level of an abstraction of how this interaction can be grasped from an STS or philosophy of technology standpoint. We aim to integrate both these schools of thoughts. While we will consider human reflection on the interaction with the automated system, we will still analyse both entities in this "adjustment" process (Akrich 1997, 207) as a performative interaction. Here Pickering's (2017, 382) concept of the dance of agency is helpful as it focuses on performance as a capacity of "both human and nonhuman". His characterisation of the dance as "an open-ended, productive, and transformative back-and-forth" (*ibid.*) allows us to conceptualise our observations of the interaction between users and the eGate as a dialectic of accommodation and resistance on the level of in situ interaction.

Contemporary automated verification and access controls can be understood as post-interface (Andreas et al. 2018), consisting of material installations with computational interfaces. At these physically localised intersections of input and output, humans and machines encounter each other in a process of transferring and decoding not only signals, but also physical influences and material components. In this human-machine interaction, the agency of the human and the machine diffuses (*ibid.*, 18). Interactions then merge into interconnected forms of cooperation and collaboration (Rieger 2019, 159), creating situative meaning. Thus, to understand and to disentangle the forms of agency at play, ascriptions and expectations toward actions must be thought of anew (Andreas et al. 2018, 18). Pickering's emphasis on both entities therefore reformulates the discussion on the impact of the configuration of users and technology, as it focuses on the adjustments made by their interplay to interactively stabilise each other. As he notes, instability is an ontological condition that is less cognitive. Indeed, performative processes can instead lead to "islands of stability" (Pickering 2011, 5), where certain aspects of the world are taken for granted. In the context of border and identity control, "technosocial assemblages" (Pickering 2017, 390) like eGates can be seen as contested islands of stability, a normalised technical procedure at the airport, in which relations to its user are formulated as usability. Thus, simply knowing how to achieve usability does not guarantee that this goal will be reached. Focusing on the users and the way in which they interact with the technology means looking at both the influence that the technology has on the user, as well as how their way of using it can modify the artefacts themselves. Hence, we have to ask how users perceive the way the machine communicates with them.

The empirical material that this article is based upon is part of a larger study on the technological developments of "truth verifications" within airport security. The following insights are based on one of our case studies that concentrated on the development of eGates, including their testing, for which we conducted technographic observations and interviews in a laboratory. Technographic observations are a specific form of an ethnography of technology, which focus "on situations [...] and sociotechnical constellations" (Rammert and Schubert 2006, 14). One of its key rules is therefore to describe interactions in a "meticulous" way, in order to reconstruct the "actions and reactions, iterations and disruptions" for subsequent analysis (Rammert 2008, 350). In doing so, the investigation was conducted using the methodological strategy of *following the disruptions* (for further elaboration see Paßmann and Schubert 2022, 293-296; Rammert 2008, 348-350), assuming that functioning technology "withdraws" in use (Heidegger 1967[1927], 69) and that the cultural and socio-genetic agency of technology becomes visible in its disruptions.

Thus, we investigated the interaction of technology (here, the eGates) and humans (in this case, the participants of the test runs) in their mutual dependency within the verification process. The term *participants* described everyone who took a turn in going through the eGates in the course of a test run. We further differentiated between two specific groups of participants: those we referred to as *users*, and those we referred to as *researchers*. *Users* characterised those who were solely engaged for test runs. *Researchers*, on the other hand, were people who worked within the context of the laboratory, but still took part in the test runs. The users were not given any specific tasks or information before their first test, other than to go through the eGates. While the test runs aimed to monitor the functioning of the systems, our focus was directed at the users and their human-machine interaction. For the purpose of the analytical focus on the disruptions and descriptions in the interaction, we neglected the inscription site of the developers. We will, however, highlight the human interventions from the operator side of the system as and when it becomes relevant to our study.

We chose a technographic approach for the observations and interviews. In terms of methodology, this meant observing technology in its making, here in its use, thereby seeing technology as an actant in its own right. This form of focussed ethnography was conducted within the context of four short ethnographic phases on site in 2022. It included 57 participant observations of test runs, 32 situational (instant reflecting) interviews with participants, and an additional nine comprehensive qualitative interviews with researchers and developers. Regarding the specific distribution of agency, the following key questions guided our analysis, which we conducted as an abductive process (Tavory and Timmermans, 2014): how did the technical script determine the human action? Are users conforming to the intended processes? When and how did users direct and shape the interaction?

## 3. Intuitive interaction?

The use of eGates follows a defined mechanical sequence. It begins with the user being asked in writing and illustrations via icons on a display to place the passport on a reader. In the laboratory setting, the participants were equipped with a card (containing a RFID chip), that

simulates the passport. After the information stored in the RFID chip has been read, a glass door opens, and the user is expected to enter the corridor. A monitor at the end of the corridor displays the user's facial image, taken by a camera. Here the machine reading or digitization of the body (see van der Ploeg 2003, 64) begins. Different coloured silhouettes and/or instructions for the correct positioning of the body in front of the camera are shown on this display. Once the facial image has been captured and compared with the biometric features of the photo and found to be identical, another glass door opens and releases the user from the eGate.

Interaction designs aim at the highest possible degree of usability, something that in turn has become synonymous with the term "intuitive use" (Oswald 2010, 2). Intuition, as Dawid Kasprowicz (2018, 160) puts it, refers to immediacy and includes the notion of smooth and unambiguous communication.

While reflections from some of the users confirmed such an intuitive interaction with the eGate, we argue that despite their characterisation of the passage through the gate as "very intuitive" (User 25), the presupposition of this intuitive character cannot be supported. This becomes clear when considering users' descriptions of their first time using the eGate in which they reported being surprised:

> Suddenly you put on a passport, then the door just opens, well, then you don't know at first what's happening and then yes, suddenly the picture appears. (Researcher 3)[4]

Here, the "informatisation of the body" (van der Ploeg 2003, 58) affects the embodiment as such. The moment in which the sensor technology co-constitutes their body appears to be the most irritating, because it leaves them unsure about what they are supposed to do. This shows that the technology does not speak for itself. Certainly, interactions with the human operators helped users reduce initial uncertainties, but the knowledge acquired here refers to a strictly instrumental handling: getting instructions about how to insert the card correctly into the card reader, or that they have to stand still in front of the camera. This additional help from the operators occurred when the users kept experiencing difficulties. Our observations show that users still lacked confidence in how to behave despite the instructions, frequently asking themselves when confronted with the camera display:

> What happens now? Do I have to look straight ahead? Do I have to look down? Or what do I have to do? (Researcher 3)

David Oswald (2010) argues that design processes are developed merely to structure possibilities for action, which are reflected in the design of a particular form or interface. This can be seen in the materiality of the reader, which clearly signals that users must place their card on the reading field. The visual communication via the card-reading display is also clearly understandable, although the users were often uncertain about *how* the card should be placed: Which side should be up[5], and "does it have to be straight in there or at an angle?" (User 2). Then the further sequences of action after this first insertion of the card were often described as unclear, and the handling of the non-(direct-)functioning of the reading process manifested differently. One way of handling these uncertainties is by switching the card or correcting

the position, and it is these actions that add up to experiences of routine handling that retrospectively lead to the perception of an intuitive handling, as one user explained:

> Yes, it's been one thing at the beginning, that I had to learn a bit. That I slide it [the card] in correctly. That I don't just put it down, but that I have to check on the screen: okay, is it placed in a way that the system can read it or not? But in the meantime, this has been integrated into the automated memory, so that I automatically place it correctly. (User 25)

The user recounts his first experience as one of trial and error to find out the right way to handle the card reader. This not only contradicts the notion of an intuitive handling but also illustrates that only through the dances of agency does such a notion unfold. Until the user achieves this island of stability, where communication becomes slowly comprehensible and coherent, a routine cannot unfold in the interaction with the technology. The passage illustrates a specific element in the dance: users structure their interrelated behaviour based on an anticipation of expectation (Lindemann 2015, 73). Thus, in the eGate setting, communication is about the systems' request for action, because it only permits further activity after the user has performed an adequate action:

> I don't know, I just lay it [the card] on it. Then it tells me to keep still and [...] then I go towards the gate. (User 8)

Many of the testers understood the interaction with the eGates in this sense, of a request for action, with the system assuming human qualities. They talk about the system "speaking" to them, about something being requested of them, or about the system refraining from making any request. Their interaction thus requires an act of understanding and as they themselves feel that they are in the reactive position, requirements for action have to be read, interpreted and, most importantly, added to lived experience. These requirements are not always immediately accessible. After inserting the card correctly and then standing in front of the display, where a silhouette appears, the users get the impression that the system wants them to move. But with its hints, the display does not initially provide intuitively obvious information for the required procedure, leading the user to move back and forth in front of the camera. This user's trial and error-acting is perceived as if the system wants them "to dance" – which would be a preposterous affordance even in the context of a laboratory situation.

As this shows, it is only a repetition of dances that makes the initially irritating request to find the correct place to put one's body more understandable. As the user explained, when the request becomes separated into literal individual steps, he is then able to follow:

> It already said very clearly, "okay you're not where you're supposed to be right now, so please move" [...] "again more precisely". (User 9)

Here the routine itself unfolded in ways whereby the users have to provide their own meaning. However, the translation and understanding of expectations do not always succeed, as the perception of these faults show. These are not errors per se, but can be aspects that delay

the process because it is unclear what the system wants. This may be due to the ambiguities already mentioned, the lack of clarity about how to act, and the visual prompts on the display (silhouettes or instructions) not being perceived as helpful. Users reported feeling forced to modulate their distance and body height themselves in relation to the norm inscribed by the machine, as one user explained in detail:

> Well, I don't get as close as I probably should in order to completely fill that empty head. But I don't think I need to either. So, I don't know if the standard head is just designed for a 6'1" man [...] I don't know – so my head is significantly smaller. And that doesn't matter though. So, that's a space and that's okay. (User 20)

The user acts in a way that deviates from the intended course of action, ignoring the "pre-scription" (Akrich 1997, 208) of the system to fully fill-in the silhouette. There is a lack of cooperation and the inscribed agency of the system for modulating the users' action is suspended. By taking the perspective of designers, this must result in a breakdown of the system: filling the silhouette is expected to indicate the correct position and distance from the camera that is needed to achieve a picture of sufficient size and resolution to enable a match with the biometric picture in the card. Instead, the user exercised her own agency by moving her body only as close to the display as experience had taught her would result in a sufficient camera shot of her face. Thus, a clear "self-evident" distinction of the body itself and the information about it cannot be drawn (see also van der Ploeg 2003, 58). As this is also an example of a mismatch between "the inside and the outside of objects" (Akrich 1997, 207), we will further elaborate on the issue of adjustments.

## 4. Waiting

Pickering's (2017, 382) suggestion of the need "to take seriously the performative grounds for a dualist perspective" of the human-machine entities has the consequence of "put[ting] us humans in our place". Within the eGate interaction, this place often means that the human user is waiting for the machine to proceed and to communicate what further actions are required in order to proceed. The users in our field observation had to wait for the machine to read their entrance card, then to wait for the door to open to let them into the corridor, then wait for the camera to frame their face, then for the software to recognize their face (while comparing it to their ID card picture), then wait again for the door to let them out of the corridor. The periods of waiting therefore dominated the whole user experience within the eGate. To grasp the essence of this, we can follow Gerd Sebald (2020, 994) when he defines waiting as "only oriented toward an event's occurrence, not its substance and thus must be differentiated from a-waiting an event (anticipation)". Furthermore, he states that waiting "is the temporal difference between the (first) anticipation of an event and its occurrence" (*ibid.*). Understanding the action of waiting as a pure projection onto the future helps us to interpret the quality of waiting that we observed. Many of our users experienced this waiting as an annoyance, a feeling which came from the anticipated occurrence having not yet set in:

> That is a bit irritating. So, it is not quite clear why you have to wait so long. I've accepted that you have to wait a little longer because I've been through it a few times. (User 18)

The users at each stage expected a certain action of the machine: to identify, to read with a follow up action that allows them to proceed; clearing, giving approval, opening the door. Instead, they found themselves repeatedly in a situation where they did not see any action by the machine. It was not just unclear to them *what* was happening – since they were aware of the black boxing of the machine – but rather *if* something was happening at all. For the dance to evolve, both entities alternate in activity and here the "passages of human passivity are precisely passages of material activity" (Pickering 2012, 4-5). But this does not mean that this activity becomes part of an island of stability regarding how to effectively pass the eGate. Instead, the machine becomes unreliable, as its agency is not communicated to the users. So when the human actors do not see that there is an action on the part of the machine, this forces them into a seemingly passive role. Additionally, when they started to act, because they felt that the machine was not acting as it should, they became insecure, not knowing if what they were doing was correct. In the laboratory experiments, the users reflected that it would have been helpful to know why they were waiting, because, as Sebald describes it:

> We indeed do ascribe delays to a certain extent to problems of transmission, which is also confirmed by the machines, be it by an hourglass icon, a progress bar ("Loading, please wait"), or any other symbol signifying delay. (Sebald 2020, 100)

Thus, if they knew why they were waiting – whether due to malfunction of the machine, their own wrong actions, just slow processing – their agency could have been played out: they could have adjusted their actions. It was the lack of communication on the part of the interface (and here again, a lack of reduction of the complexity) that kept the dance going.

This points to another quality of "waiting". Mikio Fujita (2002, 108) has differentiated two qualities of waiting: what is waited for and how we wait. The first should not be confused with precisely what is anticipated, but rather the broader shift which one waits for. Fujita gives the examples of nature (waiting for a change in season), becoming (birth of a child) and instrument machinery (which is our realm). Each anticipated process is different in the manner of its impact on ourselves and therefore has a different effect on the way we wait. In our case study, there was nothing at stake for our users, since this was part of a research process in the laboratory. Although Fujita (2002, 110) describes the realm of instrument machinery as a "world of means and ends" in which it does not matter how we wait, since this does not pose a difference for the machine, it would be different for the eGate users who are waiting to pass a real border. In the real context a perspective is helpful, which points to the ordering effect of temporality in datafied environments (Leese and Pollozek 2023, 2), since temporality cannot be seen independently from the devices through which it is experienced. On that note, one can imagine that the kind of nervousness, uncertainty and anticipation that was already being observed in the laboratory would be increased under real conditions, as reflected by the users:

> I think if you actually give your passport and it loads for so long, that's a blatant stress situa-

> tion. So [...] for social reasons, so to speak, I would rather say it would be pleasant, if it then simply said, "we are just processing" or "everything is fine". (User 20)

The way one waits can involve being patient, with hope or expectations, as Fujita says, but also with fierce anticipation when it comes to our research example. In the laboratory, patience was the key characteristic that we observed while users were waiting. The users thought about things, moved a little when they thought they had to adjust themselves, bounced, fiddled with their glasses, all of which again can be interpreted as endeavours to pursue the dance.

The specific process of waiting that we observed can be grasped in relation to what Sebald (2020, 998) characterizes as "waiting for the readiness to communicate, waiting for the diverging selections of information, utterance and understanding". Another step in his description is termed as "waiting for the follow-up communication". This includes a specific timeline or, as Sebald phrases it, this form of "communication is sequentialised and gains its own particular rhythm" (*ibid.*). When this sequence is out of balance, it leads to irritation:

> Then I first thought he wouldn't recognize me. Because it took a relatively long time and you get a bit irritated somehow when it doesn't work out the way it did before. (User 15)

The specific timely rhythm is just one characteristic of this interactive dance. An even more fundamental aspect is that this human-machine-communication is no longer based on verbal interaction, but rather on textual and symbolic signs on screens (see Sebald 2020, 991). In our (general field) example, border control has previously been offered as human-to-human, verbal and visual communication at the border police counter, but which is now complemented by the choice of using a purely electronic text and visual language based eGate. One of our users specifically makes the comparison:

> If you stand in front of it too long [...], then you start to ask yourself, will I get through or not? Yes, it's like when the official takes too long to put the ID card in the machine and doesn't make a friendly face. And the moment he makes a friendly face, you have no more concerns, but when he looks grim, you think "Oaahhh what happens now". (User 22)

If the technology proves to be irritating in the manner of its communication, the testers adopt their own strategies to deal with it. Waiting for the technology to react, for example until the door opens after the card has been inserted into the reader, can be seen as something more active than meets the eye. By drawing on the work of Peter Sloterdijk (2009, 589), whose thoughts are framed by the exploration of "competing modi anthropo-technical behaviour", one of these modi is the willing exposure to the efficiency of others. As in the case of our eGate interaction, or rather the dance – where one entity swings back, letting the other turn itself around – the user actively allows something to be done with themself. Drawing on Sartre, Sloterdijk (2009, 591) emphasises that this form of welcomed passivity is an act of "appropriation" of an "external determination to reappropriate" oneself. This becomes evident when a user stands in the eGate, attempts to be in the camera frame and waits for the system to signal that everything is fine, and they pass. Sloterdijk coins this as a "postponed

way of self activity" (*ibid.*, 590) since the user exposes themself to the activity of the machine. In allowing others to affect oneself – such as the software underlying the interface, that will signal that the user can pass and direct the machine to open the gate –, the user participates in an external competence (*ibid.*, 593-594). This occurrence after the period of waiting for the follow-up communication (Sebald 2020) has been phrased as a call to action, either as the machine is "telling me to" and only a few times as "it was asking me to [do something]" (User 27). Here, we witness the "skilful nonproficiency" (Sloterdijk 2010, 14), which finds its shape not just in waiting, but in the specific form of how we wait for the machine to take the next step to keep the dance going. For this a contemporary idiom is serenity (Sloterdijk 2009, 594). So, patience can be transformed into serenity, as when our interviewees said that they would give the technology the time it needed, or if they excused it by saying "that can just happen" (User 19). Reflections like that were ascriptions of a human-like neediness of the machine to which our users reacted with serenity.

## 5. Reciprocal adjustments

We have looked at the active passivity of waiting as a reaction and the perceived passivity of the machine as the missing reaction. Now we will look at a third facet of the interaction at play: the "zones of intersection where the non-human world enters constitutively into the becoming of the human world and vice versa" (Pickering 2012, 4).

The oscillation of activities are also oscillations of agency. In human-eGate interaction this can be quite interwoven and fluent, as the phenomenon of waiting can best be described as reciprocal anticipation, resulting in adaptations which we can call reciprocal mimicry. At first the human user anticipates what the machine might expect of them. This evolves partly through the interpretation of what the eGate communicates visually, with text, but also through its plain materiality and design. The actual performance of the machine leads to what the human user anticipates by their own behaviour. Central to this specific performance of the eGate interaction is the materiality of both entities. While much of today's digitised communication is characterised by the loss of relevance of physical presence, the opposite is true for our case study. In the human-to-human border control context, both actors are present, verbally and visually engaged, and are supported by certain technological devices (e.g., passport scanner). In the case of the eGate, the bodily co-presence of the human in the interaction invites a totally different activity. We can observe the request for routine and passive activity as a "recentering of the human being" (Andreas et al. 2018, 10), even though they only make up one part of the interaction. This recentering can be described as a new quality of interaction, since digitised media would not request an active user that is engaged in an interface, but rather one whose passivity is necessary for the interaction. The human user needs to show a "conscious withdrawal of the activity on the part of the user" (see *ibid.*, 12). Our users even draw the conclusion that their (passive) actions are imbued by a somatically felt routine: "Intuition somehow comes from knowledge. So the body will have gotten used to it somewhere" (User 5).

This leads to another point of relevance the human body has in the interaction, which is that of a medium to make oneself understandable to the machine (Rammert and Schubert 2019,

127-132). This kind of interaction can be seen as reciprocal mimicry, which Harry Collins (2010, 55) describes as "mimeomorphic", when there is no varying social context. In contrast to his understanding of polimorphic actions, which can only be conducted by humans, he sees mimeomorphic actions as mechanised, repeating actions from machines and people (like a salute). This reciprocal anticipation can meet with mixed success, sometimes functioning better and sometimes worse. The eGate users in our laboratory felt prompted, but sometimes did not know how they should comply with it. They even complained that the technology did not "play along". An example of this was when they needed to extensively adjust their posture and position, despite the fact that the corresponding actions, such as adjusting the camera in height or horizontally, should have been carried out by the technology itself. Some users were literally performing "dancing steps" in front of the camera: changing their distance to the monitor by repeatedly going forwards and backwards, or by stretching and getting on their knees. As with "waiting" these adaptations can be read as "skillful nonproficiency" (Sloterdijk 2010, 13), as users' actions sometimes do not have a causal effect. In the "dance of agency" this is a taking on of action by the users while the machine remains in presumed passivity, as the technical processing remains invisible to the eyes. It then shows that the machine is programmed to anticipate the human behaviour and reacts to it in a mimeomorphic way.

The central aspect of the facial recognition component in an eGate was the location of the person to be captured by the camera and so render the body into information. The head frame shown on the display attracted a great deal of attention. It has been recognised as a prompt in which one should fit one's own head, and correct one's own position until it matches correctly. This is where the intuitive interaction comes into play most readily, since the framing provided them with sufficient orientation. The users gave a variety of descriptions of how the instruction to bring the head to a specific height is conveyed by signs, like a head contour. Although it is mostly clear how the head must be positioned, the challenge remains to implement this, and thus the in- and outside of the machinery are experienced as incongruent. In this context, users reflected that it was not clear to them how their head should be fitted into the displayed border, for example because the size of the face and the size of the frame could not be reconciled. Others lacked an orientation point, indeed, it was unclear to them where exactly they should direct their gaze.

> Interviewer: "How did you know where to stand?"
> User: "I don't know, that just has been the problem. I was standing at the gate; I think I was standing a little too far away. The device didn't react and at some point, I noticed that the frame around my head had a little more distance than I thought was normal. So I took another step forward so that my face was practically completely in the frame, so that there was no air between the frame and my face". (User 28)

At this point we witness the oscillation between being led and leading the interaction. Sometimes the users would adapt the location of their body in anticipation of the action of the technology. They would do so by configuring height and distances to the camera through steps forward or back or by leaning their upper body back and forth, or even adjusting their height by crouching or stretching. Here, Sloterdijk's description of humans as "adaptive bi-

omachines" (2010, 11) seems to characterise such users in their eGate interaction. The machine adapts to the user and the user to the machine. In the eGate, these adaptations come in the form of mimeomorphic actions, since they are mechanizable on the part of both. Thus, the continuing change of agency becomes apparent.

## 6. Final remarks: Oscillations of agency

Our research showed that technology does have an inscribed logic of action that functions like a script (Akrich 1997), but that the script does not always reveal itself at the first time of use. The technology therefore requires human adaptation for it to function as desired. The users must adapt by learning to read and comply with calls to action. We do see the relevance of Linhardt's (2000, 84) description that machines force humans "into a very specific format of action". We are, however, missing the recognition of a reciprocal influence in this characterisation of human-machine-interaction. Furthermore, the consequence that humans cannot negotiate the required act in a literal sense no longer applies to current human-machine interactions. By adopting an STS perspective on the co-constitution of actions of human bodies and material technologies, the interaction can still be understood differently from being predetermined and instead be seen as a "technically conveyed and sensually embodied" interaction (Rammert and Schubert 2019, 125).

Our case study showed that the scripts of interaction are not inscribed by designers alone, nor followed upon as planned. They are always co-authored and modified, and one could even say that they are also negotiated by others such as the users. Therefore, we saw that the concept of intuition works on "fragile chains of operations [...], [which] are composed of simulated movements, body routines and industrial norms" (Kasprowicz 2018, 161). In Pickering's work on the islands of stability, which he sees as a manifestation of the "dance of agency", he shapes the idea that both entities are interwoven in an asymmetric way (Pickering 2017, 394). Our results support this insight: by scrutinising the concept of usability and taking a closer look at the agency of humans and technologies in interaction, we have seen both the tuning of technology into the social and the tuning of the social into technology. In the dances, technology's agency is not something stable.

Determining the process of walking through the eGate and the feeling of intuitively handling the walk-through is better termed as an idiosyncratic routine stemming from reciprocal mimicry. That indicates the importance of materiality, both in a physical way and by acknowledging the "body of information" that unfolds as part of performing embodiment (van de Ploeg 2003, 64). Still, coming from a perspective of Pickering's duality, the active part of the machine does make a difference. For example, the irritation and uncertainty that users experience can lead to frustration, and even impatience, with the process, and to people being distracted and/or adjusting on their own to deviate from the system's specifications. That, on the one hand, can hinder, or at least slow down, the whole process. On the other hand, here we see how users are adapting their behaviour to achieve a state of usability of the eGate in which the call for action can become routine. Although the incongruent working of the interior and exterior of the machinery represents a black box to the users, they feel it is more important for them to continue

"dancing" by reciprocal mimicry. Experiencing deceleration right up to stagnation is a result of distributed competencies. To Pickering (2017, 383) the decentred part of the interaction of "waiting" seems to put the human in a place of passiveness, stripped from any control of the situation. But as the users are tuning their practice to the perceived limitations of the technology as part of the oscillation of agency, the social also influences the technology. As we have shown, waiting has to be read differently from being an inactive part of the entities at play, as it can rather be seen as a passive competence. These adaptations might not point to causal effects, but they at least hold together the action sequence for using the eGates.

Thinking of the user in the way Sloterdijk suggests opened a more intense perspective on how to understand the human-machine interaction at play when it comes to the eGate and its interface. Sloterdijk emphasises that modern society is characterised by the paradox of simultaneous increasing and decreasing competence of human beings (2010, 11-15). While we are continuously developing our skills to navigate and use things we do not understand, we are at the same time incompetent when it comes to gaining knowledge of the black boxes that surround us. The inner worlds of the devices that dominate our daily lives are impossible to perceive and understand. The characteristic of those black boxes is that they turn to the user in a way that enables them to be used despite an "internal hermeneutic" (Sloterdijk 2010, 15). This is where user-focussed design steps in. The more complex the inner life, the more the interface needs to turn to the human being in order to draw the human to the device. Thus, the more incomprehensible the black box, the "more invitingly the box face must smile into the customer's natural face and signal to him: you and I, we can do it together" (*ibid.*, 15-16). Design then provides the tools for a continuing "sovereignty-simulation", where users buy themself the sovereignty of use through the design. From Sloterdijk's (2010, 17) point of view, these tools allow humans not to feel unconscious in the face of contemporary technological developments.

At this point we are confronted with one side of the aforementioned prism, as which border technologies can be understood. Looking at the microlevel of interaction can have an impact, even when the general developments of securitized border infrastructures (Trauttmansdorff 2022) and their filtering effects are discouraging. Of course, eGates have a corresponding agency in the real border context. They filter, grant or deny access. They practice exclusion and translate sovereign power. But when we see such a border technology as a manifestation of a biotechnological governance, are we able to value the insight as an opportunity in which human agency is possible and effective, so that there are moments of engagement, influence and creation? As our case study showed, by introducing a focus on usability, (laboratory) tinkering could bring back and secure human agency within this context, since it demonstrates that even automated systems rely on human bodies, their movements and other senses. This points to the relevancy of the users, instead of just focussing on the sovereign ambitions that are realised within the laboratory as Bourne et al. (2015) show. Akrich (1997, 211) suggests that "[i]f we are to describe technical objects, we need mediators to create the links between technical content and user". Therefore, testing arrangements such as the one we observed in our fieldwork can be spaces for meeting those mediators and an opportunity to turn them into spaces of challenge.

To accompany the tinkering in the laboratory means experiencing that they are not just spaces "for the production of scientific knowledge", but also spaces where the "distinction

between device [...] and laboratory [...] is a blurred one" (Bourne et al. 2015, 311). Looking at the laboratory offers insights on different stages of the co-functioning of the human-machine and research-site. In this spirit, Sarah Kember's (2014, 195) scrutinization of "smart photography" has shown that algorithmic facial recognition operates using traditional stereotyped categories (e.g., regarding ethnicity or gender). She then offers a constructive analysis by suggesting connecting algorithms which are able to break the inscription of bias. In doing so Kember transforms what Akrich, Pinch and Oudshoorn have been emphasising and what we have also tried to show: that there is no determinism in the use of technology. Rather we see all kinds of influences, whether stemming from users or innovators, that can modify the technology in question. As a matter of fact, the same applies to border technologies.

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## Notes

[1] All translations of German quotations into English, both from the interviews and from pre-existing literature, are by the authors.

[2] We follow the concept of technography as it is coined by Werner Rammert, who characterised it as "a microsociology of technology, in which ethnographic methods of observation and description" are being further developed (Rammert and Schubert 2006, 19).

[3] For a critical reflection of the term "smart" border, see Trauttmansdorff 2022.

[4] For the purpose of confidentiality, all names and sensitive information are referred to as numbers in the order of interviews and observations.

[5] Although this irritation can almost certainly be attributed to the empirical setting in which the users were operating with a smart card, Sontowski describes irritations in his observations of eGate tests in the real border field, which he refers to as "misconducts" (2018, 2741).

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