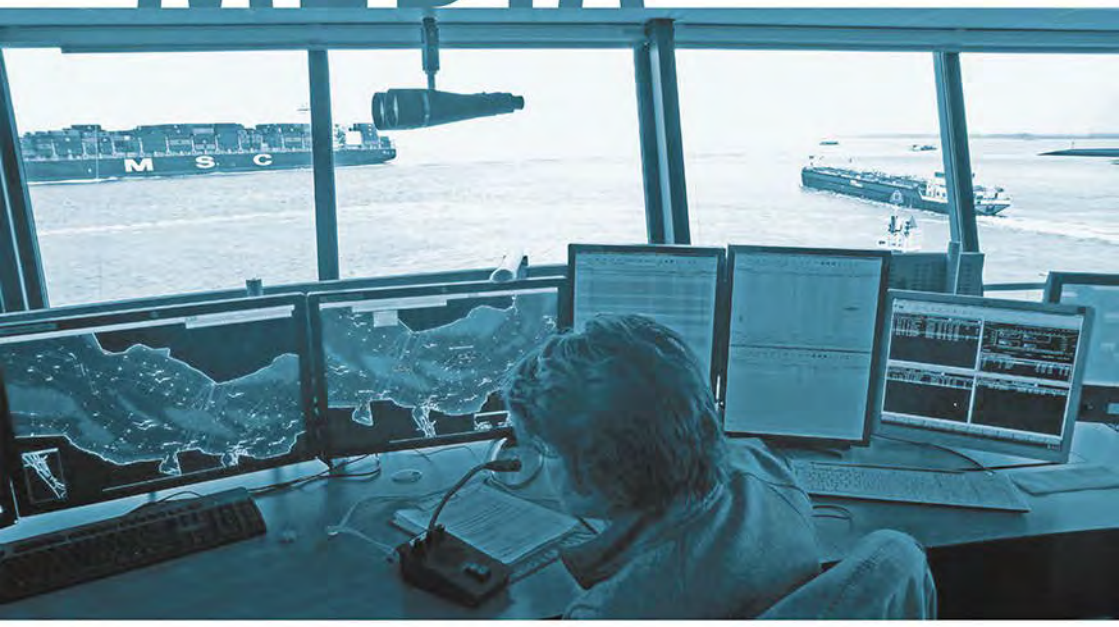
Asher Boersma

NAUTICAL MEDIA



An Historical Ethnography of Ships and Control Rooms

[transcript] Media in Action

Asher Boersma
Nautical Media

Media in Action | Volume 8

This publication was made available via Open Access with funds from the Open Library Community Medienwissenschaft 2024.

The Open Library Community is a network of academic libraries for the promotion of Open Access in the social sciences and humanities.

Vollsponsoren: Technische Universität Berlin / Universitätsbibliothek | Universitätsbibliothek der Humboldt-Universität zu Berlin | Staatsbibliothek zu Berlin - Preußischer Kulturbesitz | Universitätsbibliothek Bielefeld | Universitätsbibliothek Bochum | Universitäts- und Landesbibliothek Bonn | Technische Universität Braunschweig / Universitätsbibliothek | Universitätsbibliothek Chemnitz | Universitäts- und Landesbibliothek Darmstadt | Sächsische Landesbibliothek, Staats- und Universitätsbibliothek Dresden (SLUB Dresden) | Universitätsbibliothek Duisburg-Essen | Universitäts- und Landesbibliothek Düsseldorf | Goethe-Universität Frankfurt am Main / Universitätsbibliothek | Universitätsbibliothek Freiberg | Albert-Ludwigs-Universität Freiburg / Universitätsbibliothek | Niedersächsische Staats- und Universitätsbibliothek Göttingen | Universitätsbibliothek der FernUniversität in Hagen | Staats- und Universitätsbibliothek Hamburg | Gottfried Wilhelm Leibniz Bibliothek - Niedersächsische Landesbibliothek | Technische Informationsbibliothek (TIB) Hannover | Universitätsbibliothek Kassel | Universität zu Köln, Universitäts- und Stadtbibliothek | Universitätsbibliothek Leipzig | Universitätsbibliothek Mainz | Universitätsbibliothek Mannheim | Universitätsbibliothek Marburg | Ludwig-Maximilians-Universität München / Universitätsbibliothek | FH Münster | Universitäts- und Landesbibiliothek Münster | Bibliotheks- und Informationssystem (BIS) der Carl von Ossietzky Universität Oldenburg | Universitätsbibliothek Passau | Universitätsbibliothek Siegen | Universitätsbibliothek Vechta | Universitätsbibliothek der Bauhaus-Universität Weimar | Zentralbibliothek Zürich | Zürcher Hochschule der Künste

Sponsoring Light: Universität der Künste Berlin, Universitätsbibliothek | Freie Universität Berlin |Bibliothek der Hochschule Bielefeld |Hochschule für Bildende Künste Braunschweig |Hochschule für Technik und Wirtschaft Dresden - Bibliothek | Hochschule Hannover - Bibliothek | Hochschule für Technik, Wirtschaft und Kultur Leipzig | Hochschule Mittweida, Hochschulbibliothek | Landesbibliothek Oldenburg | Akademie der bildenden Künste Wien, Universitätsbibliothek | Jade Hochschule Wilhelmshaven/Oldenburg/Elsfleth | ZHAW Züricher Hochschule für Angewandte Wissenschaften, Hochschulbibliothek | Westsächsische Hochschule Zwickau | Hochschule Zittau/Görlitz, Hochschulbibliothek

Mikrosponsoring: Ostbayerische Technische Hochschule Amberg-Weiden | Deutsches Zentrum für Integrations- und Migrationsforschung (DeZIM) e.V. | Technische Universität Dortmund | Evangelische Hochschule Dresden | Hochschule für Bildende Künste Dresden | Hochschule für Musik Carl Maria Weber Dresden, Bibliothek | Palucca Hochschule für Tanz Dresden – Bibliothek | Filmmuseum Düsseldorf | Universitätsbibliothek Eichstätt-Ingolstadt | Bibliothek der Pädagogischen Hochschule Freiburg | Berufsakademie Sachsen | Bibliothek der Hochschule für Musik und Theater Hamburg | Hochschule Hamm-Lippstadt | Hochschule Fresenius | ZKM Zentrum für Kunst und Medien Karlsruhe | Hochschule für Grafik und Buchkunst Leipzig | Hochschule für Musik und Theater „Felix Mendelssohn Bartholdy“ Leipzig, Bibliothek | Filmuniversität Babelsberg Konrad Wolf - Universitätsbibliothek | Universitätsbibliothek Regensburg | Bibliothek der Hochschule Rhein-Waal | FHWS Hochschule Würzburg-Schweinfurt

Asher Boersma

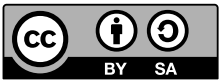
Nautical Media

An Historical Ethnography of Ships and Control Rooms

[transcript]

Universität Siegen, DFG-Graduiertenkolleg “Locating Media”

Bibliographic information published by the Deutsche Nationalbibliothek
The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available in the Internet at https://dnb.dnb.de/



First published in 2024 by transcript Verlag, Bielefeld

transcript Verlag | Hermannstraße 26 | D-33602 Bielefeld | live@transcript-verlag.de

Cover concept: Maria Arndt, Bielefeld
Cover illustration: Asher Boersma
Printed by: Majuskel Medienproduktion GmbH, Wetzlar
https://doi.org/10.14361/9783839473733
Print-ISBN: 978-3-8376-7373-9
PDF-ISBN: 978-3-8394-7373-3
EPUB-ISBN: 978-3-7328-7373-9
ISSN of series: 2749-9960
eISSN of series: 2749-9979

Printed on permanent acid-free text paper.

For Yael

Contents

Foreword

What are nautical media? This question is likely to be asked not only by those unfamiliar with media studies, but even by media scholars themselves. Firstly, this book uses 'media' where others use 'technology'. This is done in order to focus on why technology is developed and how it is used, because technology is always situated between a user and the world (other users, other technologies, networks, environment), both by design and in practice. For those still uncomfortable with this use of 'media', it may be helpful to use the distinction between public media and infrastructural media (cf. Schüttpelz 2016), where public media are those traditionally identified as media, and infrastructural media are those that make the world work, mostly outside the public eye. Second, the study of media, even in its broadest sense, has a terrestrial focus, with a few exceptions to the rule (cf. Jue 2020; Borbach 2024). The relationship between mobility and media has been studied extensively and with great success (cf. Ramella 2018, 2021; Hind and Gekker 2022; Willkomm 2022; Bender and Kanderske 2024), whereas the media used on water and between water and land have not received enough attention. This study shows how these media are arranged and configured to enable navigation on rivers, estuaries, and in ports, also through the numerous connections between land and ship. Although the focus is on inland navigation in northern Europe, its relevance extends beyond inland navigation, both through its interaction with maritime navigation and through the shared media, practices, and work biographies. Furthermore, the contrast between the two in terms of manoeuvrability, navigation techniques, economic dynamics and hydrological conditions is made productive for both inland and maritime shipping. Thus, nautical media are those technologies nested in constellations between the bridge or wheelhouse on the one hand and crew members elsewhere, river or seabed, other ships, and shore on the other hand. Such constellations primarily enable navigation, but also (and often simultaneously) economic activity, compliance with regulations, and nurturing (distant) social relations. Ships require physical separation, and nautical media both ensure this, but also bridge it. In fact, it is the constant electronic, often digital, bridging of distances that makes safe, profitable, authorized, and intimate separation possible in the first place.

One might then ask: what is historical ethnography? Again, neither historians nor anthropologists are likely to have a clear idea of what it is, let alone anyone else. If ethnography is "an account—in writing, film, or other graphic media—of life as it is actually lived and experienced by a people, somewhere, sometime" (Ingold 2017: 21) it relies on certain methods for collection in the field, like participant observation and interviews. Archival research and oral history can also be such methods, with the difference that I remained an ethnographer while doing historical research, looking for traces of lived experience. An ethnography can become a historical ethnography when the researcher realises that key events took place before entering the field (cf. Vaughan 1996, 2021). It allows the researcher to understand how the past resonates in the present, how and why people are invested in the past, and it gives the researcher and participants a common purpose in delving into the past together. It places a lived experience between past, present and future: it shows what has been "handed down" (Wietschorke 2012) and what is being handed down, not only to shape the present but also in an attempt to shape future knowledge and practices. Nautical media are thus understood within the practices in which they emerged and are now embedded.

Different Belgian, German and especially Dutch communities—skippers, engineers, control room operators, civil servants—welcomed me into their homes and workplaces, which are sometimes one and the same. For days on end, they let me witness how they work and live, and how they have done so in the past. Archives, then, are much more than the official ones financed and managed by states. What is worth remembering is therefore first preserved by those involved in the field and then generously shared for this particular reconstruction. I am immensely grateful for the openness and trust of all those involved. I cherish our conversations, the empathy displayed and wisdom shared. This would be the place to name these people. However, after several participants asked to remain anonymous, and after it became clear that others who spoke openly were in need of protection, I have decided to change all the names of people and ships still active. This leaves those who were part of the oral history project and most of whom are retired, my collaborators of chapter two: Dirk Zwijnenburg and Ruud Filarski who carefully read earlier versions of parts of this book, Jan Timmer, Rolph Herks, Frans and Mieke Heijlaerts, Fokko Boersma, and Ad van Zanten.

Asher Boersma

Prologue

At first I was not sure what Harry meant when he said "the shore turns the ship" (Field note 11.10.18). He has been sailing on a push boat for 41 years, the last 20 or so as captain. Both Harry and later the captain of the rotating shift, Pat, used this phrase as we sailed on the *Tigris* from Duisburg to Rotterdam and back. At the time, in the autumn of 2018, we were experiencing record low water levels, which narrowed the river and brought the shore ever closer. As a result, we pushed four barges instead of six. At around 25 metres wide and 180 metres long, we were still one of the larger vessels on the river. The push boat itself, with its two huge engines, lay deeper in the water than most: at times our propellers were just 20 centimetres from the river bed. It was explained to me that if they got too close, the suction would dig them in. A large rock could also have been our undoing. Whenever a ship came close, the engines were switched off. The faster a ship goes, the more water it displaces. Aboard the *Tigris*, the fear was that the other ships would take what little water we had left.

This was to be my last voyage on the Rhine. It was never my intention to leave the shore and join ships, but how people (both in the control room and on board) live at the limits of what can be planned gradually became the subject of this study. So it was only fitting that my research should take some unexpected turns. The question that preoccupied me became: how is near-permanent mobility organised in an otherwise largely sedentary society? By then it was clear that nautical media were an important part of the answer.

Many have given up the transient life on board, and ships are depopulating, but some have found a way to stay in touch. One way is to become an operator in an inland waterway control centre, most of which are run by Rijkswaterstaat, the Dutch government's "infrastructuring" (Star 2006) agency. Dirk, a skipper-turned-operator, was quoted by a nautical industry magazine at his retirement party as saying that he never wanted to enforce state authority, but to serve skippers (cf. Spek 2003).

My intention was to conduct an ethnography of a particular control room in Dordrecht, east of Rotterdam, located on a peninsula called Devil's Island at the confluence of four rivers. Its elevated position offers a panoramic view of the waterscape, with radar and CCTV completing the picture. Skippers call in on marine VHF ra-

dio and operators organise passage through what is probably the busiest waterway junction in the world.

The first time I entered this control room, in the spring of 2015, I was almost immediately sent on another mission. To my knowledge, I was the first independent researcher in this control room. I used this fact to gain the trust of the operators, as I was told by a former manager of the control room that they were particularly weary of researchers. One operator asked me if I was going to find out why their peninsula had the name it had? If it meant anything to them, I would find out why it was called Devil's Island, I decided. As well as gaining legitimacy, I hoped to find out more about the rivers they oversee, as the history of land and water is so closely intertwined in the Netherlands.

This dissertation consists of several movements which, when combined, form a rarely seen picture of infrastructure, nautical media, mobility and work as observed (ethnography), recorded (archives), represented (public media) and retold (oral history). The first movement is from ethnography to historiography. This diachronic perspective is then transported back into the present: the second movement is to return to the control room, now understanding that lived present as an "überlieferte Ordnung" (Schmidt cit. in Wietschorke 2010). However, I soon realised that staying in Dordrecht and focusing on local interactions would reinforce the physical and organisational isolation of this control room. The third movement is therefore in a synchronic direction. I started by visiting the other control rooms, hopping along the main infrastructural axes Rotterdam-Duisburg and Rotterdam-Antwerp. Then I joined ships to experience the interaction from the water. Embarking on ships became a *scaling* experience, where gradually the sum of interactions, of localities, would bring the infrastructure as network into view.

In 2015, I cornered the eminent academic Christian Heath at a conference. Together with Paul Luff, he had carried out pioneering studies of control rooms, as detailed in *Technology in Action* (2004). I told him about my field and my suspicion that there was something beyond that control room in Dordrecht, that I needed to travel further to understand the practice that had materialised there. He listened to me, then politely said that he disagreed and urged me to take a camera and zoom in on the action. That was all I needed to hear, I would prove him wrong.

In fact, my field would prove him wrong. Looking back, I decided then that the field itself should guide the research. If I wanted to understand the way operators see the world, rather than impose my theoretical structures on them, I would have to let them design the map I could survey. Nor could I impose my method on them. For example, filming their actions, as Heath suggested, would have drawn uncanny parallels with the research commissioned by Rijkswaterstaat. The work of the operators had been observed in detail in order to quantify the intensity of their work, which in the eyes of the operators was then used to justify or instigate budget cuts. Hence their distrust in those observing them and their work.

It often seemed that the only stable thing in the field was change and the ability to navigate it. Roughly three things changed considerably and consistently: 1) the way in which control room work is learnt and carried out, 2) despite regulation, the river is alive and therefore constantly changing, 3) this is best experienced from the water, by those who are constantly on the move.

Dealing with change, I thought, was a skill to be learnt. If I exposed myself to it, I would get a glimpse of the experience of those in the field, perhaps I would become better at dealing with ever-changing circumstances. Gradually, my fieldwork became entangled with a transnational life of my own, oscillating between several countries, between old friends and new colleagues, between loyalty and ambition, between curiosity and anxiety.

The idea of going on board came from the operators. They suggested that I would only understand the river, the interaction between the control room and the ships, and the mobility the operators were trying to facilitate, if I went on a few trips myself. It was also recommended that I then join different types of vessels, as their rhythm, manoeuvrability and regulatory framework varied. Many of the operators had been skippers before, but had settled for a life on land. Being an operator was a way of staying in touch with the water, as they often put it, and one of the few places where their maritime expertise had value. The cohort of new operators I followed through their simulator training were also expected to join ships and complete tasks involving interaction between the control room and the ship. Harry had welcomed many of them on board. Due to their size, push boats need to anticipate traffic much earlier, making them more dependent on mediated vision. As in the control room, it is no longer sufficient to scan the water surface optically. These vessels also have the capacity to accommodate guests. Their larger crews have individual cabins, and the owner's cabin is regularly vacant, as most push boats are owned by shipping companies that have entire fleets.

Boarding the push boat, or any ship for that matter, was not easy. I had to adapt to the ship and its practices. I had shared my ambition to join a push boat during several visits to different control rooms. Jan, a control room operator who had sailed on one in the 1970s, was a childhood friend of Harry's. Jan had just finished a two-hour stint of intense ship coordination. After rotation, we sat behind a console where administrative tasks are carried out. Without my asking, Jan called Harry. He walked away first. I could hear them catching up like old friends. Then he returned to the desk and explained my research, I wrote down some details which he added to the conversation. Harry was convinced, but said it was not his decision. He gave me the number of Josh, a senior manager at the shipping company. Later that week I called Josh, explained what my research was about and asked if I could go on a cruise. He said that they did not run cruise ships, but that they could take a serious passenger and asked me to explain everything in an email. This would enable him to explain to the crew the purpose of my visit. Below is the email I wrote:

From: Boersma, Asher
Sent: Friday 24 August 2018 10:11
To: <deleted>, Josh
Subject: joining the ship for research

Hello Josh,

as discussed over the phone just now below is a short explanation and dates when I am available.

Since 2015 I have been conducting academic research about inland navigation on the axis Rotterdam-Duisburg and focus on the interaction between control rooms and ships. This interaction I try to understand from both sides through observations in the control rooms and on the ships. I have already joined container ships, tankers, and barges. However, I haven't got to know the push boat practice.

As for my availability: the third week of September has my preference, my schedule is still empty from 17 until 21. Otherwise I have time in October too. I can embark both in the Netherlands and in Germany.

Thanks a lot for your cooperation.

Kind regards,
Asher Boersma

This email seemed to satisfy Josh. So, with our interests roughly aligned, the question was, when would there be room for me on board? That depended on when Harry was sailing—he works a two weeks on, two weeks off schedule—and if there was a cabin available. When we found a week that suited everyone, it was a matter of getting used to the rhythm of the ship. It travels between Rotterdam and Duisburg, but does not know when barges can be unloaded or picked up. In addition, the tides come into play closer to Rotterdam, so the speed of the ship varies. The week before I went on board, after the approximate date had changed four times, Josh gave me the ship's mobile phone number, which was usually answered by Harry or Pat (the other captain). Now I had to settle things with them. The first time I called, we agreed a provisional boarding time. I called every few days to see if anything had changed. To get to the ship, I had to take a taxi from Duisburg's main station to the harbour of the huge steelworks. Only one taxi driver was allowed on the site and he knew the way. Whenever the expected boarding time changed, I had to call the driver. He was aware of the provisional nature of these arrangements. Soon it looked as if I would have to board during the night, around 03.00. Pat could predict when they would reach Duisburg at their current speed, but not when they would actually be

called into port. Whenever that happened, I had a window of about 90 minutes to get there. He asked me to keep my mobile phone close to my bed. That way they could wake me if it changed again: "Later is not a problem, earlier is." (Field note 11.10.18) The ship would not wait for me.

I was staying with a friend in Cologne and needed 120 minutes to get from his house to the port. This meant that Pat and Harry had to anticipate when they would be called, as the actual call would be too late for me. The night before Pat rang to say 11.00 was more likely, the head office had said they would have to wait at anchor. I was relieved as it meant I could get a good night's sleep. I spoke to the taxi driver and agreed that I would confirm at 08.00 in the morning if 10.00 was the pick up time at the station. At 04.30 Pat called: if I wanted to board I had to get there right away. I checked the train connections and called him back to confirm that I would be going. On the way, at about 06.00, I called the taxi driver to ask if he could pick me up at 07.00. At 07.30 I was waiting on a quay in an industrial landscape that I only knew from the final showdown in an action film. A smaller boat came to pick me up. The *Tigris* was in the middle of the river, about to turn downstream with the current, when the smaller boat came so close that only a small step was needed to get on board. Harry, tall, broad-shouldered, bold, wearing a white buttoned shirt, stood there to welcome me on board.

We headed for Rotterdam straight away. Harry was at the helm, the crew busy tightening the barges, setting the lights, lowering the rudders. During the 180-degree manoeuvre to turn downstream, Harry gave the shipping company the numbers of the barges we were pushing, interrupted the phone call to tell the crew on their local radio to tighten port side, and was called on the marine VHF radio by another skipper who suggested a passing arrangement, which Harry refused. "That's sweet of you, but we're not going to do that," he said to himself, appreciating the ability of the approaching skipper to recognise our limited manoeuvrability, but finding the suggestion too vague (Field note 11.10.18). Pusher boats have no bow thrusters, so they have to use the current and the wind to make elaborate manoeuvres, Harry explained. I took it all in, grateful and relieved to be there. It was not until 15.00, when sleep began to creep in, that I asked where my cabin was. Just before falling asleep, I texted my wife that I had actually made it on board.

Several members of the crew were clearly disappointed when they were informed of the sudden change of plans. First we were told to wait for 24 hours in the port of Rotterdam, which seemed unusual. The unprecedented water levels forced the company to reconsider the usual procedures. The news spread quickly among the crew. One helmsman made the offhand suggestion that family members could come over for a cup of coffee; they hadn't seen them for 10 days. Pat dismissed the idea as impractical: they might be told to move on. Instead, plans were made for maintenance work, a young sailor would practice with his motorboat (which was tied to the stern of the push boat), and a meeting was arranged to brush up on safety

protocols. In the end, we left Rotterdam after just 14 hours. Harry and Pat took it as proof of the maxim: "The shore turns the ship." (Field note 11.10.18)

The disappointment, accompanied by heartfelt curses, took me by surprise. I thought my relief and despair at navigating changing plans was due to my status as a newcomer to the improvised mobility "community of practice" (Lave 1991). Those who live on the water routinely improvise, to varying degrees. There are variations in water levels, behaviour, weather, market, tides, traffic, all of which trigger a response, albeit in different spatio-temporal dimensions. It was my mistake to think that just because they are able to improvise, they enjoy it all the time. Looking back, I can see moments when the skippers needed time to readjust, to digest the fact that they would not be going where they were going.

The announced 24-hour delay in the port of Rotterdam was due to low water levels. It forced the shipping company to improvise on an unprecedented scale. It had temporarily expanded its fleet by hiring a large number of barges and push combinations to keep metallurgical production going. These ships have a minimal draft, so they can cope better with a shallow river.

In general, low water means that many more ships are needed to transport the same volume—in this market, skippers make good money. In August 2018, I spent a few days in control rooms during low water. There were more ships on a narrower river, sailing at higher speed, afforded by their light loads. I heard a lot of swearing on the VHF frequencies; skippers demanding more space or taking too much, eager to get to the next lucrative cargo. The water would not rise significantly until late autumn. Records were being broken, and large parts of the Rhine were no longer navigable.

Back on the *Tigris*, it was night, when over the VHF marine radio the *Amalia* called. It wanted to pass us on the wrong side, on starboard, which requires a passing arrangement and the unfolding of blue boards with a blinking white light, hanging on the starboard side of the wheelhouse. The control room in Nijmegen had listened in and told the *Amalia* to "give a bit more room, this is a pusher" (Field note 13.10.18). This intervention was made possible by the superior radar network of the control room and the software functionality that allowed the operator to plot the *Amalia*'s probable course. The operator demonstrated an understanding of our manoeuvrability and our critical draught, preventing the *Amalia*, which was moving downstream at considerable speed, from taking what little water was left under our hull. By carrying transponders, by registering when entering control room sectors, by tuning into the relevant radio frequency, ships make themselves accountable. They can use radar to account for traffic in their vicinity. In this way, they become part of a "sociomaterial" (Braidotti 2002) assemblage in which they ultimately depend on their own and others' ability to identify with what is approaching. That the operator was able to do this, that he knew how to embody the relevant dimensions

and foresee the critical variables at stake, almost certainly points to previous skipper experience.

Many operators gave up a sailing life in exchange for a more sustained presence. In general, their families were already living a life on land. One operator explained that he made the choice for his marriage and to see his children grow up, another had no choice when his wife suffered a stroke and could no longer look after their teenage daughter alone. The coast had changed their lives. The birth of my first daughter also marked the end of my fieldwork.

After leaving the push boat, I emailed Harry to ask what they had meant by 'the shore turns the ship'. I expected it to be part of a maritime idiom, but Harry wrote of a much more local use (Email 4.11.18). In the offices of the shipping company and the metallurgical parent company, plans are made which, in the eyes of Harry and his colleagues, often have practical shortcomings. When asked for input, the crews point this out—often to no avail. This leaves them disillusioned. The extent to which these plans depend on the distance between management and practice, between office and ship, between changing an Excel spreadsheet and having to make do with less crew, has remarkable parallels with the experience of operators. As will become clear, the wheelhouse and the control room have shared an ethos for decades, both rely increasingly on a very similar mediated vision, and in some cases both interact with a management class that has made unfamiliarity with established practice and practical knowledge a pillar of its ability to change practice itself.

One might think that aligning oneself with a control room is easier than with a ship. Logistically it is, the control room is static, but there are often significant obstacles to overcome. As a rule, I have visited all the control rooms I have passed while on board a ship, and vice versa: I have sailed the waters around every control room I have been in.

A voyage aboard the *Porter*, a tanker bound for Ghent, took us through the Western Scheldt, the Dutch estuary that connects the Belgian port of Antwerp to the North Sea. The control centres along this busy waterway share a transnational radar network—there are three Dutch control centres and one Belgian control centre in the port of Antwerp. When we reached the Terneuzen sector, the control room that manages the intersection of the Ghent-Terneuzen canal, Maria, the skipper, had to call in to register. Before entering the Western Scheldt through the Zandvliet lock in Antwerp, Maria and her husband Philip instructed the crew to secure all the hatches, I had to check the door to my cabin. The waves created by wind, tide and huge barges (the ones carrying containers that look more like a giant apartment block than a ship) made them nervous. Compared to other rivers, the waterscape is so vast that the optical identification of ships, with the aid of binoculars of course, is quite easy—weather permitting. Another complicating factor is the difference in speed: ocean-going vessels can travel three times as fast as barges, making it difficult to translate distance into time. Maria had to call three times – "Station

Terneuzen, *Porter*"—switching between different marine VHF radios they have as a backup (Field note 19.2.17). Finally, the Terneuzen control room answered. Maria said: "Yes, good morning, the *Porter*, passed buoy 32 and she is coming, eh, she is coming in." (ibid.) Something inaudible (to my untrained ears) followed, which Maria took as confirmation.

I had heard stories about the Terneuzen control room from an operator who worked there, they were dramatically understaffed, morale was low, he told me. It would be difficult to get into that control room, I thought: why would they want a nosy researcher around? That, at least, had been my experience with the Dordrecht control room, and I had deduced that more controversy meant less access. I decided to give it a go, to see if I could get in touch with whoever was controlling access. The only contact I had in this region was a senior manager at Rijkswaterstaat, who had previously granted me access to another control room. She replied to my email by copying a local manager, who simply replied that I was welcome and to call before I arrived. It took me fewer attempts to get into the Terneuzen control room than it had taken Maria.

It had never been that easy, so I also tried to see if they could put me in touch with the Belgian control room, assuming they worked closely together. But the team leader had no contact there, and neither did his supervisor. There was, however, a person responsible for maintaining contact with both parties, who worked for an organisation set up by the Belgian and Dutch governments. He gave me a number and an e-mail address for the Antwerp control room. I wrote that "as inland navigation is not limited by national borders" I also wanted to visit them (Email 22.2.17). The senior operator replied the same day that "it's normally no problem" but that I would have to make a formal request, including date and time, to his superior (Email 22.2.17). She was the head of all Vessel Traffic Services (VTS, the international nautical term for this type of control room) run by the Flemish government. After two emails and a phone call in which I stressed the international dimension of my project and the minimally invasive nature of my presence, she was convinced. I had to promise to come and present my results later.

My plan was to visit Terneuzen and Antwerp on two consecutive days. The former is a town on a strip of land that, apart from a tunnel under the Western Scheldt, has only one land connection with Belgium. To my surprise, I had found a city in the Netherlands that I could not reasonably reach by public transport in one day from Siegen, where I lived. The region is struggling with depopulation and is not only geographically but also politically peripheral in the Netherlands. I spent the night in a cheap hotel on the waterfront, where the other guests wore work clothes for breakfast. When I arrived at the gate shielding the control room premises, it was open, the intercom taped over with a piece of black garbage bag and the control room door, reinforced and guarded by CCTV, unlocked. The idea that something critical, presti-

gious and potentially vulnerable was being carried out here, as other Rijkswaterstaat control rooms suggest by their architecture, protocol and attitude, was absent.

Fred had been an operator at Terneuzen for more than 20 years, before which he had worked at a lock for 13 years. He had a minimised web browser on a screen to the far right of his console, which he checked occasionally. He was logged in to real-time stock market data—he trades himself. Basically, he was coordinating a huge T-junction, of which he was the only one who could clearly see who was approaching, thanks to his radar network. Ship radar is tied to a ship's position and cannot see around corners. Ships calling in were informed of the positions of other ships. The software, which overlays the radar with a nautical map, allows him to plot distances to the intersection, which he then translates into time. In the control rooms, where only inland navigation is coordinated, the speed is more homogeneous and distances are defined in metres.

When I asked him about the unguarded door, he shrugged his shoulders: they had no capacity to monitor the entrance. Going to the toilet was already an issue as the radio frequency had to be staffed permanently and the only colleague able to take over had then to abandon the other frequency. These were not unforeseen circumstances, according to Fred: "This is a deliberate policy" (Field note 6.4.17). The mouse on his console did not work properly, he cursed under his breath and wondered why they had to "work with such crap" (ibid.). Towards the end of my stay, Fred opened up a little. In other control rooms, operators were quick to voice their concerns. He explained that no new staff had been recruited for eight years, that overtime was no longer paid, and that there was no staff for the patrol vessel on the canal to Ghent. Occasionally there were nights when the control room was empty and the skippers were on their own—the local press had also reported this. At the locks on the canal, just behind the control room, staff were repeatedly dismissed after three years—"when they had finally gained experience"—to avoid giving them permanent contracts (ibid.). Fred felt that: "slowly everything is being demolished here, socially and physically" (ibid.). When he started working for Rijkswaterstaat more than 30 years ago, the organisation was "a bit boring and super reliable, now it is not boring and totally unreliable" (ibid.).

I was taken to the bus stop by another operator—the bus only ran once an hour. While I was waiting, I realised that in my twelve hours in the control room, no one had ever asked me what I did. In other control rooms I always had to declare my interest and my independence from management before anyone would open up, I had to show who I was aligned with. In those control rooms, not only was the entrance guarded, but the operators still had positions to defend within the larger organisation. To complain is to signal a transgression of a norm, a deviation from the desired state. In the case of the *Tigris*, they use the phrase 'the shore is turning the ship' to mark this transgression, implying that the shore should not be turning the ship. Fred and his colleagues resigned in who turned them.

The next day in Antwerp I had to be at a railway station at 06.45 in the morning. As with the *Tigris*, the practical alignment was left to me and those present. I had asked if there was a public transport connection—there was not. Terneuzen remained the only control room I could reach on foot. There would be a taxi there to take me and an operator to the control room. At 19.30, when the shift was over, we could share the taxi again. Although I arrived early enough, I soon discovered that there were taxi ranks at both exits and never found the operator or the taxi. Instead, I found a random taxi driver who took the fare as only his sat nav knew the address. We negotiated a fixed price, which worked out in my favour when we had to take a major detour that the driver was unaware of. An hour later, I was standing in front of a building on an island between two locks, one of them with a ship dwarfing all the surrounding buildings.

The Antwerp control room seemed to start in the corridor, the whole floor filled with consoles for traffic operators, pilot coordination and the port authority. They had planned a new building, the design was ready, but post-2008 austerity meant that the architect was bought out and an ad hoc renovation was carried out in the old building. The room had a majestic view of the docks and the entrance to the port, where the Scheldt river and its estuary, the Western Scheldt, meet. Marine VHF radio filled the room. I was greeted warmly and shown to a desk, and the chief operator said they would give me a tour when they had time.

Listening in, I noticed that most of the calls on the frequency were from inland waterway skippers. From sailing around the harbour—with Maria and Philip on the *Porter* and Rob and Rebecca on the *Liberty*—I knew that in the docks, between the seagoing vessels, barges came and went and every movement was anxiously recorded and accounted for, these skippers being aware of their vulnerability between much larger vessels. Inland navigation skippers were identifiable by their calls: they added greetings and used more syntax and were more tense than pilots. If a seagoing vessel made high waves, they would curse it, as Harry of the *Tigris* did when ships passed too close and too fast.

Thomas, a young operator of about 30, asked what I was doing. I told him about my project and he was curious about Dutch practices. When he heard that many Dutch operators had been skippers before, were proud of it and saw it as a key skill, he said that almost none of the Belgian operators had sailed before and added: "Air traffic control is not done by ex-pilots either." (Field note 7.4.17)

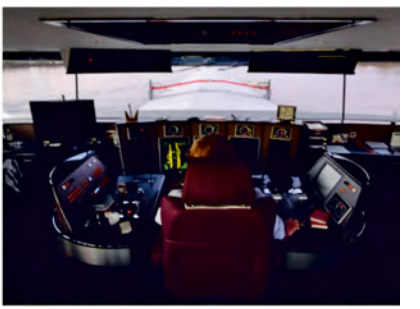
When I joined an operator called Gunter at his console in the late afternoon, he also asked how Dutch and Belgian control rooms compare. In Belgium, I said, the skippers have more freedom to sort out passing arrangements between each other. Gunter replied that the Dutch were stricter, "in Antwerp a lot is possible." (ibid.) Unlike Rijkswaterstaat or the Port of Rotterdam, only the Federal Police are responsible for enforcing maritime law. There are two agents on board a ship that they rent from another government agency, but which cannot sail autonomously. Gunter shows on

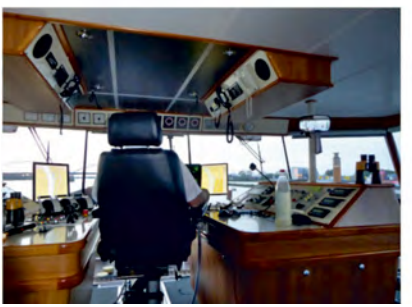
his radar that their ship is in the docks: "Very frustrating for these guys. Even if we gave instructions, all the skippers know that we can't really enforce our authority. Many of the official reports are cancelled." (ibid.)

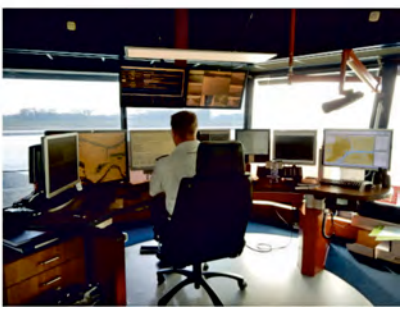
Shortly afterwards, a vessel called to ask if the control room was in contact with a sailing yacht. It had made a dangerous manoeuvre, Gunter agreed. He had no contact with the yacht and it was not responding to his calls. Gunter took a pair of binoculars, had a look and then handed them over to me. Through the haze I saw a blue and white yacht, a push boat with four barges lashed onto it and suddenly steered clear of it at considerable speed. The yacht was unaccountable, the shore was definitely not turning it.

Introduction

Figure 1: (top left) An operator working in the Nijmegen control room, located where the Maas-Waal canal and the Waal, the main Dutch continuation of the Rhine, meet. Figure 2: (top right) A skipper of barge carrying grain photographed in the wheelhouse navigating on the German Rhine. Figure 3: (bottom left) The captain of a push boat transporting iron ore on the Waal. Figure 4: (bottom right) An operator at work in the Tiel control room, at the intersection of the Amsterdam-Rhine Canal and the Waal.







After returning from the field, I realised that it is not easy to tell at first glance whether the photos above were taken in a control room[1] or in the wheelhouse[2] of a ship. They are surprisingly similar. Both are isolated from the outside world. Both rely on detection by sending and receiving radar beams and radio waves. Both the operator and the skipper are surrounded by screens and displays showing radar, nautical charts and CCTV. Precise control of their internal environment is crucial for both. They rely on ergonomics to endure prolonged observation of screens and waterscapes during shift work. As the health risks associated with sitting have become more apparent, both operators and skippers are increasingly able to work while standing. Because of the amount of light brought in by the abundance of windows, both need large (automatic) sun filters to be able to read the surfaces of computer screens and gauges.

Not only are they similar, but they are also deeply interconnected and interdependent. With many operators having been skippers before and often returning to skippering after retirement, they share a culture. One that is passed on informally. Skippers register their cargo in internationally linked databases so that the control room knows what is being carried in the event of an accident; skippers report when they approach the control room territory, known as a 'sector'. They rely on the operator to provide an overview of the intersecting traffic at the confluences of the rivers in the Dutch Delta. This overview is made possible by the elevated position of the control room, but above all by the combination of its superior network of radar antennas, overlaid with AIS (a geolocative system to see which ships are nearby) and projected onto a digital nautical map stretching several horizontally linked screens. The information is exchanged via marine VHF radio. Using a common frequency, all participants in the local traffic are aware of each other's presence and direction.

---

1 'Control room' is the most commonly used term to describe a place where it is possible to centralise a large amount of information about external events in order to influence them directly, whilst being physically isolated from them. The focus here is on mobility-oriented control rooms, specifically inland navigation control rooms, known in the nautical world as VTS (Vessel Traffic Services) centres. However, it is also shown that this type of control room exists in a larger continuum with other types of control rooms, not only those focused on different modes of transport, but also infrastructure and even military control rooms (which also have a mobility component, e.g. aircraft). This continuum is shaped by 1) a common tradition of making control rooms public, 2) not only as a pop-cultural trope, but also as an organisational interest in search of legitimacy, 3) and is also constituted by the migration of personnel between different types of control rooms, 4) and by convergence in the use and development of technology. In Dutch, inland navigation control rooms are called 'verkeerspost' or 'verkeerscentrale', in German 'Leitstelle' or more specifically 'Verkehrszentrale' and 'Revierzentrale' are used.

2 'Wheelhouse' means 'stuurhut' in Dutch and 'Steuerhaus' in German. It is the common term for the place from where an inland navigation ship is navigated. The term 'bridge', 'brug' in Dutch and 'Kommandobrüce' in German, refers to a similar place on a seagoing vessel.

Ships cannot stop or remain stationary for several kilometres, so an order has to be established while everyone keeps moving. This is done by consensus. A passing arrangement can easily involve five different vessels, which means that six people, including the operator, have to communicate their agreement or disagreement in time. However, only one person can speak at a time over a marine VHF radio. So, through sociomaterial assemblages, narrow bits of time and space are shared.

But there are also clear differences. Not everyone is equally vulnerable. The operator sits high and dry, static, while others are constantly on the move. Operators represent the state; many skippers who own their ship privately represent only themselves. Compliance also depends on authority, on the unequal distribution of power. But the operators refrain from giving orders, preferring to cajole and nudge the skippers into a temporary arrangement. Furthermore, the operator should locate and track the skippers, for the skippers it is not important where the operators are, as long as they are available to provide an overview.

This study brings the control room and the ship together to understand both better.

It may not matter much to the skipper, but operators are convinced that they need a direct view of the waterways whose traffic they coordinate. Their managers are less convinced, and believe that a central, remote location might suffice. A senior policy advisor at Rijkswaterstaat speculated that in the long term centralisation would reduce the current eleven control rooms to three (Interview 29.4.16). Other infrastructures have already gone through cycles of centralisation: the Dutch railway control centres went from forty-five in 1990 to seventeen in 2000 and are now down to thirteen, the main architect of this process told me (Interview 1.9.16). This has been made possible by automating the execution of the timetable. Unlike schedule-based rail transport, waterway transport is rule-based. There is no timetable to automate.

The comparison made by the Antwerp operator in the prologue with air traffic control has another dimension. The question of whether one should have been a skipper in order to be a competent operator depends on where and how the traffic is observed. For the Antwerp operator, the place of expertise is the interface; for him, his control room could be anywhere, but for the skipper-turned-operator, a direct view of the water is indispensable. In their study of Parisian infrastructures, Latour and Hermant (2006) claim that only the "view from nowhere," from an "oligopticon" instead of a panopticon, provides the "total view" (32). For them, therefore, one should "refrain from looking outside" (11). Places like the air traffic control tower and the control rooms of inland waterways offer grand panoramic views, but Latour and Hermant note that it is not the panorama but the diorama that is used, because "in order to take it all in at once, to 'dominate it at a glance' (…), Paris must first become small". (4) In the case of traffic on Dutch waterways approaching an intersection,

only the operator's screen can see all the traffic coming from different directions. This is what is called a "small whole" (Latour and Hermant 2006, 45).

However, this study shows that the 'small whole' does not exclude a view from anywhere, it shows how control rooms can be understood as local phenomena in a dynamic environment. What matters is local history, tradition and tensions. The latter, a long simmering conflict between management and operators, leads to control room work being made public by the operators themselves via Twitter. They share their view from somewhere with infrastructure publics (professional skippers, recreational skippers, local residents). Furthermore, during the fieldwork it became clear that the operators use the view that the architecture and location of their control room gives them an advantage. There are phenomena that only they can see from a particular position. Irresponsible leisure skippers manoeuvre their yachts where they cannot or should not. The same Antwerp operator was confronted with a yacht on the wrong side of the channel, trying to cross in front of a much larger and faster freighter. The operator grabbed his binoculars, always within reach, to see what this yacht, which was not responding to calls over the marine VHF radio, was up to (Field note 7.4.17).

The three movements discussed in the prologue—from control room ethnography to historiography, back to the control room and out to sea—inform the chapters of this book. The first movement, into historiography, covers two chapters. In the first, I delve into the history of Devil's Island near Dordrecht—taking cues from the operators, but relying mainly on archival sources. It describes the early history of the island through the rivers and canals around it. This provides an insight into the history of infrastructure and its mediated control, which in turn enables a more fundamental understanding of the first Dutch inland navigation control room built on the island. It is shown that a focus on land is insufficient to explain the island's emergence, as it turns out to be a by-product of infrastructural interventions to create new waterways. In the control room, the operators wondered where the name came from. It is difficult to say. What is more interesting, however, is how the name evolved from an informal reference to the name of an official Rijkswaterstaat site, since it was the agency itself that "enrolled" the name (Callon and Law 1982: 622) when it built a control room there. Archival research, supplemented by oral sources, paints a picture of the emergence of the control room: the rise of tanker shipping made the local public demand active protection, and Rijkswaterstaat lost the authority, and soon the funds, to intervene in the dramatic way it had done in previous decades. Surprisingly, given the high-tech reputation of the control rooms, the control rooms built in the early 1980s were not only the more legitimate but also the cheaper option compared to redesigning and creating waterways. The control rooms mark a behavioural shift in infrastructure. Framing these sites historically teaches us that, rather than the revolutionary sites they are made out to be when celebrated at their inauguration or through the persistent representation of state actors, con-

trol rooms are both a reaction to changes in speed, scale and infrastructural complexity that had already taken place, and the facilitators of the continuation of these trends.

The second chapter looks back at the work on Devil's Island at a time when Rijkswaterstaat had already abandoned the island. The work of the outdoor departments that used to be located there was increasingly outsourced and the operators moved to a nearby building on the banks of the Oude Maas. Here, too, they had a direct view of the water they had fought so hard for. Through oral history, supplemented by archival sources, it is reconstructed how the understanding of the basic requirements of the operator's work—experience on the water and a direct view of the water—could diverge between the operators and the management. It is argued that through the mediatisation of work (shifting the scope of observation from the waterscape to a configuration of interfaces), learning could be relocated, making work 'simulatable'. As a result, legitimate access to an ongoing community of practice was no longer controlled by operators and rooted in shipping. This shows how the shift from mobile life to sedentary work changed the intimacy of expertise. It is not so much automation as mediatisation that has changed work, both in the control room and on board ships, and explains a significant part of the botched professionalisation of operators. Another key component is the rise of managerialism in three forms: the transformation of nautical experts in supervisory positions into managers, the internalisation of managerial norms by every member of the organisation, and the promotion of a new type of manager who deliberately has no substantial expertise other than management. Not only was management able to prevent a costly professionalisation of the operators (as part of its own professionalisation strategy), it was also able to mobilise the previously exclusive operator perspective through mediatisation and distribute it to the skippers. Thus, it was not automation but distribution that was a cost-saving strategy, sold as a gain in 'efficiency', used to justify what operators perceived as an understaffed control room.

Throughout these chapters, I keep the notion of field intact and draw on historical anthropology to understand past practices. This allows for an understanding of the past that is almost as rich and reflexive as an ethnographic account of the present. Importantly, it also relies on a media studies-informed sensitivity to the materiality and biography of the sources themselves. Taken together, these chapters show how the present is deeply rooted in questions about the past.

Faced with a shortage of staff, the operators took to the national stage in 2015. They broke ranks by declaring on a prime-time news programme that 'safety on the rivers was at risk'. The odd thing was that control room operators claimed they were out of control. However, the operators were confronted with the perfect reputation of the control room, constructed by their superiors seeking legitimacy regardless of their actual work. More specifically, as long as there were no major incidents, budget cuts could seem justified. Normally, from an organisational perspective, it

is only important to demonstrate that someone is in control, not how it is done. This demonstration, and how it has changed, is examined in two steps. In chapter three, having mapped the visual tradition of the infrastructural control room, including locally, I look at how organisational goals are translated into architectural design. For managers and the organisation as a whole, it may not matter where a control room is located, but it does matter that it is visible. It turns out that this is not just true of nautical control rooms. Control rooms are visible markers of organisational ambition, efficiency, public safety and thus legitimacy in a way that representations of ordinary offices could never provide. The (infrastructural) control room therefore has a dual function by design, physical coordination and organisational legitimacy, which is becoming increasingly explicit, but has been there for a long time.

Then, in the wake of the public phase of the conflict, the operators took to Twitter. They began to make their work visible. These tweets are the focus of the fourth chapter and are compared to the organisational representation of the control room. The operators were able to do four things differently. First, they were able to turn their networked public into a public of professional skippers, recreational skippers and local residents. Second, the operators not only opened up an inaccessible workplace, but also offered a casual route to the visual literacy needed to understand the real situations they faced. Third, by addressing multiple audiences, the operators escaped the insider-outsider dichotomy that characterises most infrastructure work. Fourthly, by persistently presenting the 'near misses' as dangerous but nonetheless non-events, they found a way to legitimise the work of the control room, not just the control rooms, despite their success.

After a massive infrastructure scandal in the early 2000s, Rijkswaterstaat changed course. It now saw itself as a 'network manager', which meant that control rooms became a focal point. In addition, as an extension of the New Public Management dogma, Rijkswaterstaat wanted to be more 'customer-oriented'. Operators are one of the few positions within Rijkswaterstaat that have a serious job and work with tangible results: safe mobility. For this reason, the department's communication department monitors the tweeting operators on a daily basis and organises training sessions. In this context, it is not surprising that the operators engage in a form of symbolic legitimisation reminiscent of classic (military) control room publicity stunts. Operators not only make their work visible, they engage in visibility work. These may be the contours of the changing work of the operators: as the control room perspective is increasingly distributed to the wheelhouses, the operators seem to have their hands free for public relations work, while the communications department itself partly switches to monitoring Rijkswaterstaat employees in the field through a specially designed dashboard.

In the fifth and final chapter, I go on board several ships, urged on by the operators. Going beyond the isolation of the control room means refusing to remain a researcher once inside. It is to connect the operators' experience to the larger whole

of which they want to be a part. Building on the work of the first chapter, it is finally possible to move beyond the land-water dichotomy, and the chapter moves on to combine the land-based experience with the onboard experience. The chapter analyses the interplay between movement and stasis by looking at four different orderings: navigational, regulatory, market and intimate. These orderings are ongoing situated practices carried out by actors in distributed sociomaterial assemblages. In tracking different actors, the key is to follow the action through which they are connected. This allows scaling up without losing sight of the practices. It is shown that the mobilisation and immobilisation of ships is also carried out from land by control room operators, cargo brokers, family members and non-human actors such as radar networks, geolocative AIS applications and water level databases. Leisure skippers in particular would remain unaccounted for if it were not for the operators. It is only through their collective efforts that they can keep an eye on yachts that are navigating erratically. It became clear that often actors need to give market orderings priority and rearrange their position in other orderings accordingly. This results in tangible pressure, which manifests itself in various time problems. Skippers take physical risks to be just in time, to find rest and to mediate the asynchronous rhythms of loved ones ashore. At the same time, they have to maintain critical spatiotemporal separations with the riverbed, the embankment and other vessels. Media play an important role in the assemblages, keeping separate what would otherwise collide, and connecting to deal with separation.

This study is part of a tradition established at the graduate school Locating Media, University of Siegen, where media practices are captured "in situ" (Bender and Zillinger 2015: xxiv) and "in actu" (Dang-Anh et al. 2017: 18). It manages to move between different scales, connecting practices to larger trends and, conversely, rooting larger trends in an empirical everyday. It integrates media archaeology (the topos of mediated control) with historical and media anthropology (the past and present nautical everyday), moves into workplace studies (the ongoing accomplishment of control), and finally into mobilities studies (the movement and stasis of ships, data, operators). This is much more than a linear process. By following operators on Twitter, I study media archaeology in the making, showing how an isolated workplace forms and addresses publics. Practice and representation are intertwined by studying 1) the divergence of practice and representation in parallel with 2) the representation of practice and 3) representational practices. Not only are media understood in motion, enriching media studies with mobilities studies, but motion is also understood as a mediated practice that depends on the mediated control of distance.

This kind of transdisciplinary research might best be understood as what Deleuze and Guattari have called "ambulant sciences" (2010: 31), plural because it cannot be confined to one discipline. Others, inspired by the work of Ludwik Fleck (1935/1981), have defined it as "eine Arbeitsweise, die dem Geschehen folgt, die auf Improvisationen angewiesen ist und einer hohen Aufmerksamkeit für sich bietende

Möglichkeiten von Ort und Situation bedarf." (Arens et al. 2005: 91) It is important to note that in contrast with stationary sciences, conducted under more stable circumstances, it lies "in der Natur des ambulanten Arbeitens – im Ausserhalb, dass es Störungen und Hindernissen unterworfen ist. Das kann zu sehr viel Ärger führen, wir verstehen es aber als Qualität, als die Kunst des ambulanten Arbeitens, Widerstände fruchtbar zu machen und in unsere Arbeit zu integrieren." (95–6) It was precisely this attitude that helped me to constantly find new theoretical grounding in order to follow where my field led me. I found it a companion to my methodological approach to the field.

sInitially, I adhered to Latour's maxim "follow the actor" (2007: 12), which in STS is the established way to scale, as it is rooted in action in the field and not "as one of the many variables" that researchers "need to set up before doing the study" (Latour 2007: 183–4). Latour is adamant that it "is of little use to respect the actors' achievements if in the end we [researchers] deny them one of their most important privileges, namely they are the ones defining relative scale." (184) Indeed, it is often impressive how actors achieve this (cf. Zillinger 2014). In my case, I let the operators define the scale necessary to understand their work, which went beyond the control room and included the shipping itself—the skipper-turned-operator went the other way. Not infrastructure, but the work of "infrastructuring" (Star and Bowker 2006) defined the scale of my research. It is the researcher's focus on scaling, knowing that there is a larger context, that actors operate at different levels, that makes scaling visible in the first place. Scaling is always done by actors in the field, mainly through the media, and again by researchers who accompany them and trace the circulation of references (cf. Latour 1999).

This is how I traversed my field. In the process, the field was constantly redefined: first I went from watching a national news programme to visiting the Dordrecht control room, from where I was propelled in many directions: to other control rooms, back in time, to simulator training and on board ships. The Nijmegen control room took me to their German neighbours, with whom they were linked via a cargo database. Just one trip on board the *Liberty*, which I boarded at a lock on the River Main and ended up in the port of Antwerp a few days later, showed how research into a local Dutch conflict was also part of a transnational life. Even when I actively sought to overlap my various movements—visiting control rooms along the waterways I had sailed and vice versa—the implications of scale surprised me: tracking leisure yachts unaware of surrounding traffic, the logistics and politics of iron ore supplies at extremely low water levels, the physical risk and time pressures of maintaining a family life while on the move. Rather than follow the actors and report here where they took me, I followed the action and show here how it intersects.

Chapter 1 – Devil's Island

Figure 1: (left) The Scheldte-Maas-Rhine delta, with the Island of Dordrecht encircled. Figure 2: (right) The Island of Dordrecht with Devil's Island, Krabbepolder and the Dordrecht port encircled. Figure 3: Devil's Island encircled

The primary interest of this study is in practices, in what people do, in how they do it. Understanding what is happening is not always possible through the present, the world does not wait for the ethnographer before things happen. To account for the present inevitably binds the ethnographer to events of the past, many of which remain. Something similar has been described by Jens Wietschorke as the "epis-

temologischen Verklammerung von Geschichte und Gegenwart." (2010: 199) Elsewhere he explains that if

> die Geschichte als eine „vergangene Gegenwart" gelten kann, dann kann auch die Gegenwart als eine „noch nicht vergangene Geschichte" gelesen werden. So sind historische Perspektivierungen und Epistemologien auch in der gegenwartsethnographisch orientierten Europäischen Ethnologie zentral. Als wissensgeschichtlichen Grund dafür könnte man an dieser Stelle auf das spezifische Interesse der alten Volkskunde am „Leben in überlieferten Ordnungen" verweisen. (Wietschorke 2012)

Here Wietschorke reverts to the idea of "life in handed-down orders" which in a way captures what I saw when I observed operators and skippers at work. Shipping is an old line of work, control room work less so, but apparently new lines of work are often a continuation of work with similar goals, carried out by different means. Moreover, control room work is embedded in a nautical life—through career paths, systems of meaning, converging goals, socio-material practices—that has been handed down for a long time. Moreover, despite their reputation for being at the cutting edge of technology, control rooms themselves are not so new.

When we spoke, the operators in the Dordrecht control room seemed particularly interested in the historical explanation of the name of the place where their control room is located: Devil's Island—although it is actually a peninsula. As I struggled to gain structural access to the control room to conduct participant observation, I took it upon myself to find out where this name came from.

This chapter is the first of two in which I took Sven Lindqvist's adage "dig where you stand" (1979) to heart. Even though it wasn't my own story, taking my cue from the actors in my field and digging in their story was a way of participating in the field, of standing there too, in a particular, handed-down order. Furthermore, as my grandmother was born in Dordrecht, part of a family that has lived there for generations, I sometimes felt like I was reading newspaper articles that my ancestors might have read, describing events—the first bridge over the Oude Maas, the digging of the new seaport, a big fire on Devil's Island—that they might have noticed as they happened and that affected their lives. Along the way I found out that one of my ancestors had been a skipper, but settled in Dordrecht when the waters he sailed were empoldered.

We start in the recent past, discussing in section 1.1 the field experiences in 2015 that led me to delve into the past of the Dordrecht control room and, in particular, the peninsula on which it stands. Throughout this chapter, which spans several centuries, I will return to the events that took place while I was in the field. How the island (and later the peninsula) came into existence in the first place, long before it was called Devil's Island, is the focus of section 1.2. Local history and the loca-

tion of the Dordrecht control room are linked to the emergence of waterway infrastructure, the development of amphibious culture and the ideal of 'modern' water. It brings erosion and sedimentation to the fore and tells us that water also transports soil—and that rivers are living entities. This is not only relevant to the history of Devil's Island, but also contributes to a fundamental understanding of navigation on the river: skippers need to be aware of the process of erosion and sedimentation if they are to keep their hulls off the riverbed. In 1.3 an attempt is made to trace the history of the name of the peninsula. How I communicated this hypothesis in the field is reported in section 1.4, as I assumed that the operators would be particularly interested in my findings. Taken together, these three sections show 1) how infrastructure is also a handed-down order, 2) that topographical references need to be enrolled before they can be handed down, and 3) what happens when the ethnographer takes an active role in this process. In order to explain why a control room was built there, the need for mediated control is first discussed in section 1.5. Apart from the emergence of (infrastructural) control rooms in the twentieth century, this requires a look at developments in inland navigation: the unification of the Rhine as a trading area and the changes that shipping has undergone since industrialisation. The development of the Dordrecht control room, from its conception in the late 1960s to its commissioning in 1982, is dealt with in section 1.6. Here the local history of the Dordrecht control room is reconstructed: why, how and when was it built? At this stage, the reader is in a position to understand these events through the prism of the infrastructural, media and amphibious history that has taken shape in the previous sections.

What emerges is a situated, sociomaterial history of Rijkswaterstaat, how it became the flagship of the modern state's capacity for intervention, and how "the rise of the environmental movement, the democratisation of Dutch society and, from the 1980s, the rise of neoliberal politico-economic ideology" forced it to change course (van den Brink 2010: 79). The Dordrecht control room, the island on which it stands and its name bring together the different strands of this history.

1.1. "Will you decipher the name?"

The first time I heard about inland waterway control rooms, Dutch or otherwise, was in early 2015, when operators argued on a news programme on the Dutch public broadcaster NOS that they could no longer guarantee safety on the river due to budget cuts. I had written a master's thesis on the history of military control rooms and their proliferation in popular culture and popular media practice, and was working on a manuscript about 20th-century control rooms, including traffic control rooms, but had never heard of these control rooms. I found articles online, in regional print media and nautical journals that often mentioned a particular Rijkswaterstaat con-

trol room, the one in Dordrecht. That was where I wanted to go, I decided. But I could not find out how to get in touch with the control room. As a non-waterway user, I had never been to a control room in Dordrecht until that news broadcast, when I felt addressed as a Dutch citizen and a resident of river country. When I was a child, we used to go kayaking in the Linge (dammed since the 14th century), which also made for muddy swimming, but we were always told that most rivers were far too dangerous. Rivers are usually an obstacle to be crossed by bridge, sometimes by ferry. After a few phone calls, I made an appointment with Peter, a "business manager" in the shipping department of Rijkswaterstaat, the Dutch infrastructure agency. We met in the offices below the control room to talk for an hour, and then he took me up to the control room itself.

At Dordrecht station I rented a bicycle and rode towards the river, the name of which I did not know at the time. There I turned west, followed the river and soon the control room with its dark reflecting windows was in sight. The Google-mapped bike route took me through a commercial area, over the dam—with seagoing ships loading scrap metal on my left and the agency's patrol vessels moored at a jetty on my right—and onto the island, where the remote-controlled gate was open. As I parked my bike, I noticed that most of the other bikes were also rented, usually a sign of commuters. There was a camera at the entrance, with an intercom below, but the doors opened before I could ring. At reception, my ID was registered by the only woman I saw there that day. When Peter arrived, he asked her if there were "any flex offices available?" (Field note 8.6.15) She did not know, so we wandered through the corridors, peering into rooms with no outside windows, until we found one that was unoccupied and not too large.

Routinely, Peter introduced the nautical branch of the agency, its organisational structure and vision (motto: "safe and fast"), and the "conventional", "ingrained" shipping culture they had to deal with (Interview 8.6.15). He advocated centralising the ten regional inland navigation control rooms and centralising the remote control of the 230 locks and moveable bridges. He admitted that this was a consequence of budget cuts, but claimed that they were aimed at achieving an "efficiency effect" (ibid.). The introduction of transponders on vessels so that locations could be plotted outside the radar coverage of the control room—a key component of centralisation—had been laborious. Skippers feared for their privacy as their location would be known at all times, and the Agency caved in to their demand that it should not be used to enforce laws limiting consecutive time at the helm. The technology is called AIS; I was to learn all about it later. Afterwards, on the train home, I wrote of the interview that I had "remained neutral during the interview, not wanting to mention that the televised controversy as a result of budget cuts, part of the post-2008 austerity culture, was my main interest" (ibid.).

The control room was shielded by a reinforced glass door, a clunky radar screen was on display in the stairwell, large pictures of the control room hung on the walls.

Peter had a chip, but it was not working, so we had to ring the bell. A uniformed man opened the door and greeted Peter as if it were a chance meeting with an old acquaintance, as did the other operators once we were in the control room. It turned out that Peter had once been their manager. They immediately started talking about their shift, saying it was pretty quiet. Peter interrupted the conversation to introduce me, emphasising the Dutch university I was working for at the time. The operator with the most stripes on his shoulders, Jan, found the Dordrecht control room an urgent topic for research because, as he put it: "Austerity has left us understaffed." (Field note 8.6.15) The slump that inland navigation had experienced as a result of the 2008 crisis was over, traffic had increased, but where congestion on the roads is a publicly recognised sign of economic growth, their growing workload went unnoticed, Jan explained. For the hour I was there, the operators were mostly venting their frustrations, rather than giving me the tour of the control room I was expecting. Peter seemed uncomfortable, quietly but visibly disagreeing.

What I got from how they conducted their work was through how they felt impeded doing so. Afterwards I studied the pictures I had taken and made additional notes, trying to work out which instrument measured what, which acronym belonged to which interface. There were four consoles manned, with a fifth as a backup. The territory they were coordinating was divided into two parts, called sectors, each dealing with an intersection, each with several horizontally linked monitors displaying a detailed radar image provided by a network of antennas. Each sector had its own marine VHF radio frequency. These two consoles were the most intensive workstations. Of the other two, one was used to process information requests from the shipping industry and manage emergencies, and the other was the IVS station. This was where ships called in with their cargo and destination information, which was registered in the Information and Tracking-system Shipping (IVS). The last two consoles were relatively quiet places to relax after an intense radar session. Operators rotated every two hours, but the IVS console was often manned by temps who lacked the training for the radar consoles and the authority to deal with emergencies. So a radar session often lasted four hours, which stretched their ability to take in information and stay focused, Jan said. He was at the information console when Peter and I visited; the two operators at the radar sectors were largely left alone—I could not document what their sequence of actions looked like. During our interview, Peter had described Dordrecht as the busiest inland waterway sector in the world. Jan's assessment was that the budget cuts had made them "go through the floor" (Field note 8.6.15). Peter and his colleagues had come up with a new logic to justify this. It was 'corridor management', which he had told me about beforehand, where traffic is tracked along an entire route and predicted when which ship will be where (Interview 8.6.15).

Later, as Peter and I descended the stairs, he felt the need to correct something I had not made much of at the time. In the control room, Jan had said, not without

pride, that "everyone sitting here has sailed" and that this was the norm, a prerequisite for working there (Field note 8.6.15). According to Peter, "people who have not sailed can be good operators" and considered it a local norm—it was certainly not policy (ibid.).

I wrote above that on my very first visit the operators asked me to solve the mystery of the name of the island on which the control room stands, but I find nothing of this in my notes and records. Yet that was how I had always remembered it. The first record I found of this question being raised was in the field note of a meeting with the two control room managers of the Dordrecht control room, almost a year later. In response to my interest in the history of the control room, one of them, who said he had lost count of the years he had worked for the agency, asked: "So you are going to decipher the name of Devil's Island?" At the time, I was trying to get extended access to the control room, as I was still determined to research only the Dordrecht control room. Access was always granted on a one-off basis, and I was regularly told 'now is not a good time, try again later'. So, although I made no explicit promise to come up with a historical explanation for the name, I started researching in the hope of one day coming up with an answer. In the meantime, I found that operators in several control rooms were interested in the history of their work, and provided me with snippets of information and a topic of conversation. In general, operators are both in awe and suspicious of anyone with a university degree. Add to this their suspicion of researchers who had previously come in and measured their work intensity on behalf of management and reached conclusions that were damaging to the operators, and it is easy to see why gaining trust was quite a challenge. I always emphasised my independence and tried to demonstrate my willingness to listen and take advice, which later led to me boarding ships on their recommendation. At the same time, my independence seemed to frighten management. They knew that once they let me in, they had lost control. Occasionally I could use management's reluctance to gain the operators' trust, but I needed something else on which to build a lasting relationship with both parties.

Another reason for taking the assignment was that I expected to learn a great deal about the local rivers, and perhaps gain a better understanding of the behaviour of the vessels and the terrain of the operators. This knowledge could also legitimise my presence.

1.2. The island takes shape

The shape of the island is such that it looks at least partly man-made, so I pursued two lines of enquiry: 1) how did the island come to be, and 2) how did it get its current name? The first research I did was motivated by the second question. I looked at old maps digitised by the Dordrecht Regional Archive to see when the name first

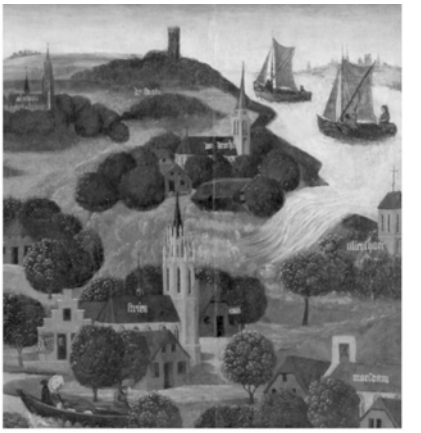
appeared. This was confusing because the lay of the land changed a lot over the centuries. I had trouble finding the spot on the map where the island was supposed to be, and when I thought I had found it, it was never called Devil's Island. So I had to concentrate on the land before I could concentrate on the name.

During my fieldwork, both in the control rooms and on the ships, I used a digital, high-resolution waterway map of the Netherlands that included Antwerp and the German Rhine all the way to the Ruhr. I annotated this map with the references used by operators and skippers over VHF radio, many of which I had never seen on the maps used in the field. As we sailed, I kept track of where we were, so I did not have to keep asking or walk up to the skipper's monitors. This map greatly improved my knowledge of the waterways and their immediate surroundings, but for the Dordrecht area I realised that the historical maps formed the basis of my topographical knowledge. Conversely, after all this field experience, I am now able to read the historical maps better.

The land that later became Devil's Island first appeared after a series of floods between 1421 and 1424, known as the Elizabeth's Floods. What was known as the Grote Waard was largely lost and Dordrecht, the region's main city, became an island in the river Merwede. These two sentences are not as simple as they seem.

In the first, 'land' can be misunderstood as binary to water (cf. Derman 2011; Schmitt 2015), but it was both. For water to carry sediment, it needs a current; when this slows below a certain threshold, sediment falls to the bottom. This can happen when water flows in opposite directions, down from the river and up from the sea. Dordrecht seems to have been such a place. Once sedimentation has started somewhere, it often continues because the water flows more slowly in shallower areas, allowing more sedimentation. After 1421, a complex interplay of currents, sediments and tides created a mudflat south of Dordrecht that gradually ceased to be submerged at the average high tide. The faster flowing water caused erosion around the mudflat, deepening the creeks. The dryer mudflat reaches a point where pollen, both in the sediment and carried by the wind, becomes trapped and the mudflat solidifies. A mudflat that is only occasionally flooded is called a gors in Dutch, the former name of Devil's Island is Krabbegors. The land seems to be named after the water, as I found an earlier mention of the creek the Krabbe next to an unnamed piece of land. At first, the first map I found that showed this (Figure 4) puzzled me because it was drawn so rudimentarily compared to other parts of the map. It was only after reading an interdisciplinary publication by archaeologists, historians, biologists and geologists that I knew what landscape imagery to conjure up, one that I knew from childhood holidays on the Wadden Islands in the north of the Netherlands (cf. Cleveringa et al. 2004; Leenders 2004).

Figure 4: (top left) The Island of Dordrecht in the early 16th century, with the city in the north and mudflats in the south-west. Figure 5: (bottom left) The city of Dordrecht surrounded by water, as represented after the 1421–24 floods. Figure 6: Fragment of a panel made for the local church about 80 years after the floods, depicting the broken dyke in Wieldrecht, south of Dordrecht, in 1421.



The second sentence could be read as the sea reclaiming the land, as nature intervening. But even then it was difficult to distinguish between nature and culture as agents of change. The term polder is easily used indiscriminately for any low-lying land that exists by the grace of the surrounding dikes, but it refers to reclaimed land that was previously a lake or sea. The Grote Waard was not created out of nothing, it was land that had previously emerged and was diked to keep it dry (cf. Leenders 2004). This was moorland that was harvested for fuel. In addition, ditches were dug for drainage, which caused the land to sink. As a result, the Grote Waard became deeper and deeper, which meant that the pressure on the dikes came only from the water side (cf. Cleveringa et al. 2004). Hot summers may have preceded the flood, further weakening the peat dikes—it is only since the collapse of a peat dyke in the Dutch town of Wilnis in 2003 that it is fully understood how peat dikes keep water out by retaining water themselves (ibid.). Due to armed conflicts in the region between the local nobility, funds for substantial improvement of the dikes were limited and the economic need to win turf prevailed (ibid.). Some maps show the city of

Dordrecht after the Elizabethan flood as an island (Figure 5), whereas previously it was shown as the northern part of several land patches. The idea that land was lost instantly fits in with the idea of the Flood as a dramatic event. This is how it has been handed down, 'flood' in the singular, with dramatic numbers of victims—only in the 1970s was this number considerably reduced (cf. Gottschalk 1971–1977). In fact, the country was not permanently inundated, but was abandoned after two later floods (cf. Cleveringa et al. 2004). First, a storm surge breached the dike at Wieldrecht (Figure 6), flooding the land with seawater from the west, but the surge receded and much of the land survived. Later, the river dikes in the east broke twice, and the bleak prospects for the land became clear. The diversion of rivers by dams and the restriction of their paths by dikes had resulted in more water than there was room for. The land south of Dordrecht was therefore deemed unsustainable and the dikes were no longer repaired.

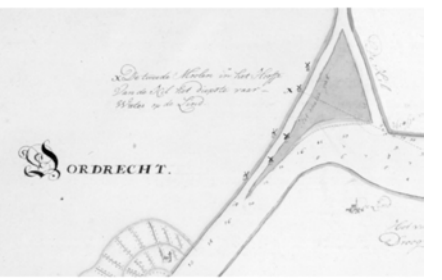
It is likely, however, that the loss of land was part of a cycle, so that the loss of land, like the gain of land, was a temporary phenomenon. Eventually the water would come, but it would reshape the land, recreate it and provide new opportunities, such as salt production (cf. Leenders 2004). The danger is to project the modern concept of water as contained and separate from land (cf. Linton 2010; Morita 2016) onto pre-modern practices. However, the understanding of flooding as part of a cycle around which life is organised, which was still present at the time of the Elizabethan floods (cf. Leenders 2004), seems to have gradually lost ground in favour of flooding as a calculated but nonetheless undesirable eventuality.

The attempt to keep water and land separate was part of the effort to turn water into infrastructure (cf. Brand 2011) and thus nature into infrastructure (cf. Carse 2012). This was manifested, for example, in the construction of locks where previously there had been dams, adding transport as a function of waterways to drainage (cf. Brand 2011: 133). In the 13th and 14th centuries, cities in the north-western part of the Netherlands flourished, both benefiting from and initiating new north-south routes over water (cf. 135, 9). This threatened the importance of Dordrecht. The relative size and economic importance of Dordrecht was increasingly dependent on east-west traffic, on this axis it was "an international gateway", as "it performed a function in (…) trade between the interior of Europe and England and France" (143). Cities in Holland competed on the basis of infrastructure, and Brand divides them into roughly two camps: those who sought to improve their situation through infrastructural interventions—mainly locks and canals—and those who opposed these projects of their competitors and regularly prevented their realisation. Dordrecht belonged to the latter—it feared being bypassed and losing its (semi-)natural advantageous position as a critical passage point to the west, towards the sea, to the east, towards the Rhine, and possibly to the south, towards Antwerp.

Scholars have identified a shift from a disaster culture to a risk culture, but it is perhaps best understood as having long been an asynchronous, local practice (cf.

Bankoff 2013). The possibility of flooding was countered by established evacuation practices and infrastructure, such as churches built on higher ground (often artificially raised), sometimes with the explicit purpose of sheltering people and livestock during floods (cf. van Dam 2017). Even breached dikes did not completely lose their infrastructural function, as they allowed transport, which was essential for rescue operations (ibid.). Van Dam studied floods between 1675 and 1953 and refers to "the long [Dutch] tradition of cultural adaptation to floods" as "amphibious culture" (88).

Figure 7: (top left) The creeks and mudflats southwest of Dordrecht. Figure 8: (bottom left) Still creeks and mudflats, but on the western edge a waterway is dug out. Figure 9: (top right) The Nieuwe Vaart is dug, the island takes shape. Figure 10: (bottom right) The same waterway is called Mallegat here; map is upside down.



The landscape of mudflats and creeks west of Dordrecht, with the Krabbegors on its northern edge, shrank over the course of the 16th century as the island of

Dordrecht grew in size and more and more mudflats were diked. Although Dordrecht was structurally constrained by the infrastructural interventions of competing cities, it sought to improve its own access to the sea. The creeks on the western side (Figures 7 and 8) were dug out and joined together in the early 17th century to form a wide waterway called the Dordtsche Kil, which gave Dordrecht a better connection to the sea by bypassing the shallow mouth of the Maas to the west of Rotterdam (cf. Alkemade 1941: 240), and which still runs south-west of what is now Devil's Island. A Dutch word for a stream running through marshland is kil—so the name Dordtsche Kil, like Krabbegors, is a trace of a past landscape sedimented in toponomy. At first, the Kil was only connected to the Krabbe, which connected to the Oude Maas to the north. In 1656 the Nieuwe Vaart (Figure 9), later called the Mallegat (Figure 10), was dug eastwards from the northern tip of the Kil (cf. Alkemade: 237). This turned Krabbegors into an island, the outline of which can be seen on today's map, especially the sharp point of Devil's Island.

Devil's Island is the by-product of infrastructural interventions, of waterways built to improve Dordrecht's connection to the sea. For a long time, Rotterdam was dependent on Dordrecht for access to the sea because the mouth of the Maas, which flows through Rotterdam and provided the shortest route to the sea to the west, was becoming shallower. So ships from Rotterdam had to sail south-east to Dordrecht before they could sail west to the open sea. A shortcut to the south was built between 1827 and 1830 with the Voornse Kanaal, which had enormous capacity and prevented ships from having to sail east from Rotterdam to reach the North Sea (cf. Alkemade 1941: 241; Filarski 2014: 64). The construction of this and many other canals can be largely attributed to King Willem I, known as 'King Merchant', who had great ambitions to develop the Dutch economy through large-scale infrastructure projects, mainly canals (cf. Filarski 1995). This is when national interests begin to overtake local ones, so it was much more than a victory of Rotterdam over Dordrecht. Although Willem I found it difficult to delegate and was involved in great detail, another, rather young institute was heavily involved (cf. Filarski 2014: 72).

Rijkswaterstaat enters the scene

The French invasion of 1795, which overthrew the Republic of the Seven United Provinces and established the Batavian Republic, formed the basis for the creation of a centralised Dutch state in 1798, which broke with regional autonomy. This state assumed a new role by taking on more responsibilities, including for public works (cf. van den Brink 2010: 72), and created a central agency to manage them (cf. Lintsen 2002: 554), initially called the "Bureau voor den Waterstaat" (Bosch and Ham 1998: 34), now known as the Rijkswaterstaat. Regional interests hindered translocal mobility, as we have seen above, but also had a negative impact on safety. The effects of any intervention in a river were felt downstream, so that one region's

improvement was another region's danger (cf. Krause 2016). In 1810, Napoleon integrated Rijkswaterstaat into the Corps des Ponts des Chausées, a bastion of military engineers, from which Rijkswaterstaat adopted its military discipline and hierarchy (cf. Lintsen 1980: 59–65). The newly established republic allowed members of the middle class to gain influence, and the hegemony of the elite began to crumble (cf. Bosch and Ham: 31–2). Initially, Rijkswaterstaat's status was poor and its influence limited; its staff suffered from a lack of formal training, in contrast to the traditional Dutch military engineers, who tended to be members of the elite (cf. van den Brink: 73). The agency specialised in hydrology and its hydraulic engineers were allowed to hold an official title and wear uniforms; power and status grew steadily (ibid.). When French rule ended in 1815 and King Willem I came to power, Rijkswaterstaat remained and even gained in status—benefiting from the monarch's ambition and the economic tide. Training at the Royal Military Academy in Breda became compulsory and the "semi-military organisational model" was maintained (van den Brink: 74). The secession of Belgium in 1830 and the subsequent mobilisation meant that Rijkswaterstaat dramatically lost funds and influence (Lintsen 2002: 557).

It was not until 1848, when a civic elite came to power as a "democratic polity", that the tide turned for Rijkswaterstaat (van den Brink: 74). Formal education moved into the academic realm, away from military engineering, and employees of Rijkswaterstaat founded the Royal Institute of Engineers, signalling their professionalisation. These civil engineers undertook ambitious new projects that brought considerable prestige to Rijkswaterstaat: rivers were diverted and deepened, reducing flooding (cf. van den Brink: 75). Modernism first arrived as an ideology in the form of a strong belief in progress and the belief that nature could be shaped (cf. Heezik 2007: 87–8). Crucial to this was the standardisation of rivers, which gradually allowed the culture of risk to transcend the local. The rivers were too wide and shallow, which increased sedimentation and further reduced their capacity to transport water and enable navigation (cf. Bosch and Ham 1998: 115).

A prestige project of Rijkswaterstaat in the second half of the 19th century was the Nieuwe Waterweg (cf. Bosch and Ham 1998: 78). The aim was to provide the port of Rotterdam with direct access to the west. Until then, both the Voornse Kanaal and the Dordtsche Kil had to cross treacherous waters to reach the open sea. Construction began in 1865, and the canal was scheduled to be completed in 1869; digging continued until 1873 (cf. Filarski 1995: 119), but the desired depth of 6.5 metres at low tide was not reached until 1896 (cf. Bosch and Ham: 131–2). The idea of the engineer in charge, Caland, had been to excavate a first layer of the canal and manipulate the current until it was strong enough to erode the waterway to the desired depth (cf. ibid.). Steam power was used and further innovation in dredging technology was triggered (cf. ibid). In a circular causality, new waterways both enabled and were enabled by industrialisation.

In the course of the 19th century, the port of Dordrecht was overshadowed by the port of Rotterdam (cf. Alkemade 1941: 245–7). The Nieuwe Waterweg seemed to seal Dordrecht's fate as a seaport. Rotterdam, now in a different league, became the largest port in Europe by the end of the century (cf. Heezik 2007: 111). Dordrecht lobbied long and hard to improve its situation (cf. Alkemade 1941: 242). In the first phase, in the middle of the 19th century, Rijkswaterstaat's efforts to deepen the rivers were aimed at balancing the distribution of water among Dordrecht's rivers (cf. Heezik 2007: 112). In the late 19th century, river works intensified with a focus on mobility: the Mallegat and the Dordtsche Kil were deepened, widened and the latter straightened (cf. ibid.).

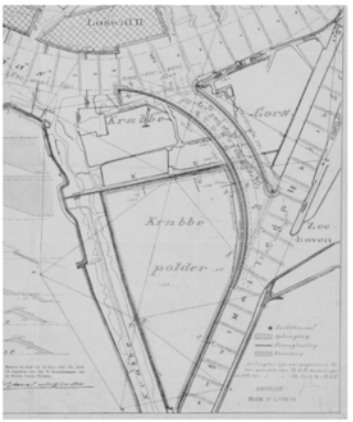
However, Dordrecht wanted further improvements, and in 1897 a government commission made an inventory of the possibilities for improving Dordrecht's connection to the sea, but nothing was done (cf. Alkemade 1941: 242). In 1912, amid widespread scepticism about whether the investment would ever pay off and complaints from Rotterdam, Dordrecht began construction of a seaport called Wilhelminahaven, located south of the Mallegat, opposite the Krabbegors (cf. ibid.). By the time it was completed in 1918, the government had formally recognised the importance of transforming Dordrecht into a seaport, and in 1925 a major project began (cf. Alkemade: 143). The Oude Maas was to be the main link to the sea via the Nieuwe Waterweg, which made the Krabbegors an obstacle. Sailing around it meant a series of difficult manoeuvres, including rounding the sharp north-eastern point of the island, so a channel was dug through it, now known as the Krabbegeul.

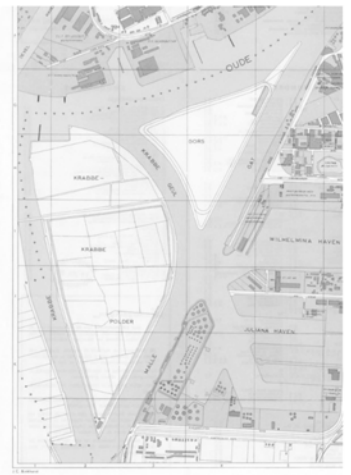
At some point, the Krabbe, which runs from the Kil to the north towards the Oude Maas, was dammed, giving the Krabbegors a land connection to the west (Figure 11). The southern part was turned into agricultural land (Figure 12) and the Krabbe was reopened in the early 1930s (cf. Dalen 1931–1933: 20). The curve of the Krabbegeul is so perfect that it reveals the drawing board as the origin of the landscape. However, only the second port to the south of the Wilhelminahaven—the Julianahaven, completed in 1958 (cf. Frijhoff et al. 2000: 396)—looks as if it really flows into the Krabbegeul (Figure 13).

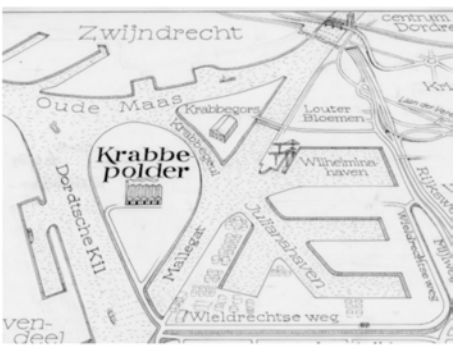
All that is missing are the two dams in the Mallegat, one connecting the island of Dordrecht to the Krabbegors and the other to the Krabbepolder (Figure 14). In 1970, a national newspaper reported that Rijkswaterstaat intended to convert the Krabbe into a waterway as part of efforts to improve the accessibility of Moerdijk (cf. N.R.C. 1970), an industrial area south of Dordrecht where Shell had set its sights on a large petrochemical complex. The Krabbegeul would no longer provide access to the Dordtsche Kil, but only to the port of Dordrecht. Therefore, the Mallegat would be dammed twice to create more space for ships to dock—the dredged sludge would be used to raise the "little peninsula" (ibid.). The (re)construction of a waterway and the raising of a peninsula are closely linked. The article also mentions that Dordrecht's

crossings are the busiest in Europe, with 600,000 ships a year, which prompted Rijkswaterstaat's intervention (ibid.).

Figure 11: (top left) Fragment of a 1927 Rijkswaterstaat map, with the Krabbegeul drawn into the map. A dike seems to connect the Krabbepolder with land to the west. Figure 12: (top right) Detail of an aerial photo showing ships lying in the new Wilhelminahaven, and with the agricultural use of the Krabbepolder clearly visible. Figure 13: (bottom left) Detail of map that shows the new sea port in the south, opposite of the Krabbegeul. Figure 14: (bottom right) The Mallegat is dammed twice; Devil's Island, though still called Krabbegors, has taken shape.







Devil's Island thus became a peninsula. In an internal Rijkswaterstaat letter from 1972, the peninsula is mentioned as a possible location for a "shipping supervision and information post"—it is referred to as "Duivelseiland" (Arrondissementsingenieur 1972) In a 1973 letter, the director of the Dordrecht district writes to his regional supervisor that "my predecessor at the time suggested building a new office building on Devil's Island" (Arrondissementsingenieur 1973). It seems that Rijkswaterstaat's had Devil's Island in its sights as soon as it started restructuring the junction south of Dordrecht.

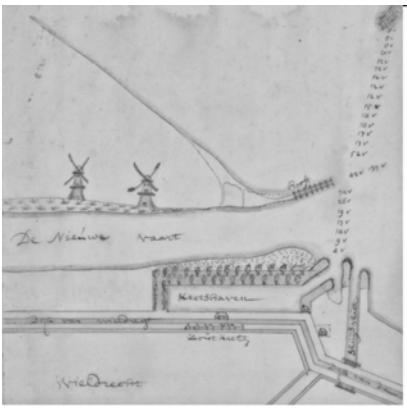
1.3. Enrolling a name

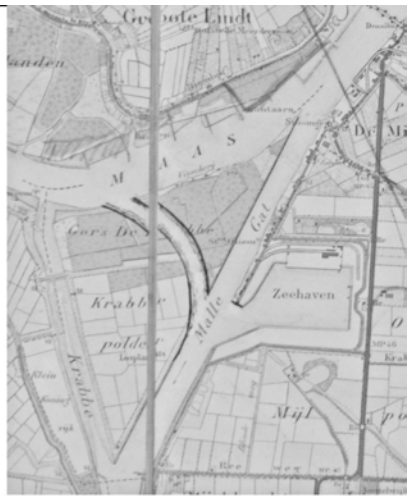
Now to the second question, the roots of the name. Remarkably, no map from the time before Rijkswaterstaat settled there mentions Devil's Island as such. After the Krabbegeul was dug, it was still called Krabbegors, although the apparently unused part on the western side of the Krabbegeul was also called Krabbegors (Figure 12). The hypothesis that the island was given a separate, new name because of its new official function does not hold up. It may be that Rijkswaterstaat consolidated the name after the 1970s, as we shall see, but Devil's Island was used as a name much earlier. There is clearly a discrepancy between use and records of use, as many names are never recorded although they are used for long periods.

Inland navigation uses many topographical references which are probably largely unknown to those not involved in inland navigation, even if they live along rivers, as they have no relevance to their everyday lives. Often they refer to things that have long disappeared: a patch of trees, a farm, a dockyard, a brickworks. Although unstable as an optical reference, they have been there long enough to become a reference, and more stable than the river itself. They are part of an effort "in which a provisional order is proposed", as Callon and Law put it (1982: 622). In the culture of navigation, in the *community of practice* of inland navigation (cf. Lave 1991), many topographical references—crucial for establishing a shared understanding of a position—are only passed on orally. Newcomers in the control room annotate their radar-layered nautical chart with these references, as they can customise and save how they like to arrange, scale and annotate their interface (Field note 17.8.18). On a ship, I witnessed a captain giving a sailor the helm for an hour and questioning him about topographical references—he had previously turned off all the labels on the map so that only shapes were visible, although many of the places he was asking the sailor about were not on the map anyway, as I later discovered (Field note 12.10.18). If the attempt to "impose order" is accepted, it is "enrolled" (Callon and Law 1982: 622). What follows is also a history of the enrolment of Devil's Island as a name.

Newspapers used the name as early as 1917, before the island was split in two by the Krabbegeul. A colleague of mine had suggested that the name might come from the diabolical shape of the island. Seen from Dordrecht, the Krabbegeul looks like a triangle with two horns. However, the name was used before it had this shape, before the Krabbegeul was excavated. Many of the topographical clues I found in the field are explained by (former) activities or buildings. If the skippers had started to use the name, what would have prompted them to do so?

Figure 15: (top left) The Nieuwe Vaart where it joins the Oude Maas with windmills on the Krabbegors. Figure 16: (top right) A fishery indicated on the Krabbegors along the Oude Maas. Figure 17: (bottom right) Aerial photograph indicating industry along the Mallegat. There are four cylindrical objects near the outermost point of the island, possibly the four oil tanks of Gips.





Maps from the 17th century show windmills on the northeastern tip of Krabbegor, when the Mallegat was still new enough to be called Nieuwe Vaart (Figure 15), and an early 20th century map shows a fishery on the northern flank of the island (Figure 16). Aerial photographs from around the same time show a strip of industry

along the Mallegat, warehouses and cranes (Figure 17). Newspaper articles mention a company called Gips, which produced sleepers, wooden beams laid across the railway tracks. The sleepers were treated with creosote, possibly oil tar, because on 26 April 1917 the Rotterdam newspaper Maasbode reported that two of these oil tanks on the Gips premises had caught fire the day before (Maasbode 1917). Several newspapers mentioned the incident, but the Maasbode was the most detailed. It used the name Devil's Island and added that this was in Dordrecht. A national newspaper felt compelled to explain in more detail that there had been a fire in Dordrecht "on the so-called Devil's Island, in the river Oude Maas, below this municipality." (Tribune 1917) In 1921, the "shipping news" section of a local Dordrecht newspaper mentions in staccato prose: "The German steamer 'Grimin', Captain Fisher, loaded with sleepers from Winclau, berth Devil's Island, wharf Gips" (Courant 1921). So the earliest mentions relate to the creosote practices on the island, which were generally not very healthy, and the oil fire must have produced thick black smoke. All very fitting for a Devil's Island, perhaps, but the 1917 Maasbode article uses it as a reference, not as an invention.

Other early mentions of the island match its sinister name. In 1922, the same local newspaper reported that the lifeless, "completely naked body of a fourteen-year-old boy", presumably from a nearby town, who had disappeared while swimming, was found "on the mudflats of the Krab (so-called Devil's Island)" (Courant 1922). Apparently the name of the island was still unstable enough to require the addition of 'so-called'. In this way, the local newspaper refers to a social practice, a reference known to its readers. Some names can be linked to an event and thus dated, such as when a place is named after a queen, like the Wilhelmina and Juliana docks on the other side of the Mallegat on the island of Dordrecht. These are places that were designed, inaugurated and then used. Other names were probably not invented overnight, but came to life as they were used.

In my research in the newspaper archives, including national but especially local ones, I found many references to another Devil's Island, the one known as Ile du Diable, the notorious French penal colony. From 1896, local newspapers in Dordrecht wrote frequently about the island, and in particular about the trials and tribulations of Alfred Dreyfus, a French military officer who was falsely accused of espionage and imprisoned in the penal complex in French Guiana. Émile Zola was deeply involved, publishing his open letter "J'Accuse…!" (1898), the master of early cinema George Melies made a series of docudramas about it (1899), there were publications across linguistic regions: it was an early international transmedial affair and made Devil's Island an international public concept, kept alive by the publication of memoirs by (alleged) former prisoners, novels, plays and films throughout the 20th century.

There are actually several Dutch Devil's Islands. One island off the coast of Jakarta was known as such during Dutch colonial rule. It had a shipyard and a prison and was used for quarantine and banishment (cf. Schaap 2002). In Amster-

dam, there is a neighbourhood built around 1897 on raised ground in the middle of unused, wet land on the outskirts of the city (cf. Kuyenhoven), which is said to be known for the stench of a candle factory and its rough inhabitants (cf. Loos). To the north, in the Veendam marshes, there was an island of the same name (cf. Brand de Boer and Jonkman 1990). In 1910, several newspapers, including one from Dordrecht, reported a fire in Veendam in a building "on the so-called Devil's Island, which housed families whose members often clashed" with each other (Courant 1910). It is mentioned that the neighbouring coal factory was spared (ibid).

All this makes it likely that many Devil's Islands, the one in Dordrecht and others, got their name at the end of the 19th, beginning of the 20th century, after Ile de Diable. Only the island off Jakarta seems to have had the name for much longer—it is mentioned in a travel report published in 1797 (cf. Stavorinus). So I thought that the places had in common that they were isolated, but often not out of sight of the mainland, rugged in vegetation, population and activity, often producing industrial haze and odour. Although I was approaching a plausible hypothesis, I was unsure if it was enough to report back to the control room in Dordrecht.

Then, at the end of October 2017, an operator in Dordrecht tweeted (Figure 18): "Today a publication in @ADdeDordtenaar about where the name #Devil's Island probably comes from. This is where our control room is located". I panicked a bit when I read it. Twitter had been a way of keeping up with what was happening in the field; through a Twitter list I had been keeping track of what the Rijkswaterstaat operators had made public over the past three years. These accounts are used to inform skippers about construction work or obstructions, but also to inform the general public about the work of the control rooms and the safety of the waterways. I wanted to get hold of a copy of the local newspaper, hoping that the allegation was false. But I was at home in Berlin and the article was not published online. I tried calling an aunt who lives in Dordrecht to ask if she could get me a copy of today's edition, but she did not answer. Then I remembered that a friend of mine had grown up there and I wrote to him. A relative of his got me a copy, he forwarded it and I waited anxiously for the post.

The article, a full tabloid-sized page, was written by a local historian, Jaap Bouman—I had come across his website before. Entitled "The sinister Devil's Island", it asked "Where does the name come from?" and followed a similar strategy to mine: first find out the history of the island, then the history of the name. The first part seemed pretty accurate, so as I read, I feared the conclusions of the second part. Bouman had found a witness whose father had leased a piece of land on the island. The father "told his (…) friends" at the local football club, at that time a centre of social life in Dordrecht and of which the father was a prominent member,

> about his holiday and weekend cottage on the Krabbegors. "It's just like Devil's Island over there". This caused much amusement among his (...) friends, who from then on talked about Devil's Island. (ibid.)

The crucial point is when this happened: "around 1930" (ibid.). However, the earliest mention I found in the newspaper archives dates from 1917, which was probably only a local oral tradition. Bouman assumes that the island was formed before it was named, but this does not seem to be the case: as detailed above, Krabbegors was called Devil's Island before the Krabbegeul was dug.

Later, when the newspaper put the article online, operator Rolph tweeted a link. Although I could refute the article, I could not really offer an equally clear alternative, just a hypothesis, so I decided I had nothing to tweet. On my next visit to the control room in Dordrecht, I saw the page hanging on a magnetic board, but made no mention of it.

1.4. Testing a hypothesis

Sharing the results of my work with the field was a tentative process. I was reluctant to interact with them online, partly because the intimacy of offline fieldwork in general and the control room in particular felt at odds with the publicness of Twitter.

Unlike most operators, Rolph was not a skipper before joining Rijkswaterstaat. He joined the agency directly after his training as a motor technician (Interview 26.2.18). His father also worked for Rijkswaterstaat (ibid.). Rolph first sailed on patrol vessels, which he still does occasionally, before becoming a control room operator. Another operator, an oldtimer, said that Rolph was something like their spokesman, referring to his Twitter activity (Interview 20.2.18). As will become clear later, many operators are more attached to the shipping culture than to Rijkswaterstaat, an order that is sometimes incompatible. Rolph may be a Rijkswaterstaat man first, but he is trusted enough by those who identify primarily as skippers to be their spokesman.

On his account, @VLW_Rolph, he maintains a professional persona. He sticks to the template set by Rijkswaterstaat's communications department, which is also visible in the homogenised handle: 'VLW' indicates his function as "verkeersleider", someone who directs traffic (the 'W' stands for 'water'). Rijkswaterstaat's Twitter handles are organised by function—there are also a few operators who have kept their account unofficial, emphasising in their bio that the tweets reflect personal opinions. The tweeting operators were aware that they were being monitored (Field note 17.10.16).

During my struggle to gain permanent access to the control rooms in general and the Dordrecht control room in particular, it became clear how sensitive Rijk-

swaterstaat staff are about public image and the possibility that I might publish the wrong things. While navigating the treacherous waters of field access, I was wary of revealing too much via Twitter, partly because I was still figuring out how to convince the gatekeepers. But Twitter was also a way to get in direct contact with the operators, albeit with the communications department watching our every move.

Another problem was that I am not an experienced tweeter. I joined Twitter hesitantly, having never been on a social media platform before, as a way to connect with fellow academics during the protests against the Dutch neoliberal university in 2015. The dominant use of Twitter in this community, especially after the protest movement died down, is self-promotion. I had kept my account to keep in touch with my former colleagues after moving to a German university, particularly because I valued the cross-departmental connections I had made. However, my social media socialisation, offline interaction "*verdinglicht*" online (Lukács in Paßmann 2018: 18), also hindered me in engaging too frivolously with operators on Twitter. My reflex was to stick to the pattern I knew, so I didn't follow or tweet to Rolph because I didn't really have time to talk to him in person. I had met Jaap, an operator in a Rotterdam control room run by the Rotterdam Port Authority, who was also professionally active on Twitter. Like Rolph, Jaap was a coach on the simulator training course for future operators. It was the Twitter algorithm that recommended Rolph's tweet about Bouman's article, as the display of the tweet on my timeline was accompanied by the text "VTS.Jaap likes this" (Figure 18).

Figure 18: Screenshot of tweet by operator Rolph with a photo of the newspaper article about Devil's Island.

Figure 19: Tweet by author, retweeted by operator Rolph. Depicted is an early drawing of buildings on Devil's Island made by Rijkswaterstaat itself from 1975.

In addition to being a spokesperson, a broadcaster, Rolph is also embedded in his community of practice formed by other tweeting operators and skippers. It was this element of his network that interested me most when I finally mentioned Rolph in a tweet of mine, having not yet met him. I tweeted what I had found in the archive about the early history of the Dordrecht control room (Figure 19). A month after Bouman published his theory, I shared various historical material to gain recognition and to thank the operators who had always helped me. The insecurity towards the field had diminished as I realised that I knew enough to have conversations about their work without them having to explain everything—in the control room I knew what was happening. When Rolph tweeted Bouman's article, I felt I had missed an opportunity to use the issue to gain what Lave calls "legitimate peripheral participation" (1991: 64). Reflecting on my position after Bouman's publication, I realised that I had found many other ways to achieve this, to the point where both skippers and operators were asking me if their line of work would be something for me. However, I wanted the tweet to be visible to all my followers, including my own academic community, so I did not address Rolph directly by putting his handle first, as this would have prevented the tweet from being visible to my followers. Also, as I thought it was good publicity material, I did not want to risk it being forgotten, which would have been the case if Rolph had ignored it.

I was grateful when Rolph accepted the 'gift' (cf. Paßmann 2018) and retweeted the early sketch of the Dordrecht control room.

Bouman had begun his article: "Devil's Island is part of a former island in the mouth of the Dordtsche Kil. There is not much to do there. It is best known for the traffic centre for (inland) shipping" (2017). Google Maps—the contemporary measure of geographical existence—names the island Krabbegors, but when searching for 'Duivelseiland Dordrecht' it displays its iconic red pin on the island, as if Devil's Island is a place on the Krabbegors. The caption of the pictures accompanying Bouman's article reads "Aerial view of the former Krabbegors". In this way, Bouman and the newspaper position 'Krabbegors' as a thing of the past, and mark a date for the birth of the new name in the only daily newspaper that Dordrecht has left. Who am I to argue against this particular enrollment? Or, to be more precise, is it necessary to correct his version, since even my attempt would ultimately contribute to the registration of the name anyway? Bouman seems to be solidifying the decades-long effort to register Duivelseiland as a site of Rijkswaterstaat. Rolph's echoing of Bouman's theory is part of the enrollment of the name among a heterogeneous public. The fact that he felt the need to add in his tweet that the control room is located on Devil's Island implies that he is not sure that everyone knows, that he is also addressing laymen, because every skipper I have met knows about Devil's Island in Dordrecht.

Later, in 2018, during the interviews with the operators, I reluctantly presented my hypothesis. These interviews were part of the oral history project I conducted on early control room practice, as described in the next chapter. But informally, whether on a ship or in the control room, conversations about the past were frequent: in retrospect, the oral history part of my research had begun before I registered it as such. Then, at the beginning of 2018, I started visiting operators at home—most of them are retired—and talking for hours while recording the conversation, discussing documents and photographs, both theirs and those I found in the state archive. No one was really convinced by my hypothesis. They accepted that the theory in the newspaper was no longer plausible, but for them my idea was fishy. One operator, a tall and gentle man called Jan, took my discrediting of the new hypothesis as an opportunity to dust off his own theory (Interview 20-2-18). For him, the dangerous currents and riptides around the island, as indicated by the name Mallegat, were the best explanation.

> I think it has to do with something nautical. It was, of course, when the Haringvliet [once an estuary of the Rhine-Meuse delta, south of Rotterdam, now a freshwater lake] was still open. Then there was a mad current here. (…) All these names: Mallegat, Vuilegat, I say, difficult to navigate, current from all sides, with the engine power they had back then, sailing and steam… (Interview 2.2.18)

When Jan started out as a skipper in the second half of the 1970s, the Mallegat had just been closed—the old-timers he sailed with must have known the currents around Devil's Island inside out.

Jan's reaction made me realise that it might never have really been a question for me to solve. At first I thought, perhaps arrogantly, that the question was being posed for me to give it an existence beyond the control room, or to integrate the operators' historiographical discourse into one beyond the isolation of the control room. Now I think that is silly. Paul Rabinow described ethnographic writing, apparently borrowing from Paul Ricoeur, as "the comprehension of the self by the detour of the other" (quoted in Geertz 1988: 92). While the skippers-turned-operators had a clear identity to fall back on, I too had found one: that of the *Besserwisser*. Now I know that my presence is legitimised not by giving answers, but by having a sustained conversation about the past.

Perhaps Bouman gave the operators a founding myth of Devil's Island. As Alasdair MacIntyre put it, a "myth is living or dead, not true or false" (1967: 435), although Schilbrack claims that "the life or death of a myth is bound up with its credibility" (2002: 9). But why should the ethnographer be the arbiter? It looks like I had approached the emic, that what is part of and alive in the field, as etic, that what could be explained objectively. As such, I had not heeded Latour's advice when following the actors, as then, "your task is no longer to impose some order, to limit the range of acceptable entities, to teach actors what they are" (2007: 12).

1.5. The need for mediated control

Surprisingly few texts on control rooms ask where they came from, what prompted their creation. Here I paint a broad historical picture in five steps: 1) the unification of the Rhine as a waterway and commercial space, which both preceded and was driven by industrialisation; 2) how the mechanisation of the fleet during industrialisation—after a long, uneven and hesitant start—increased the scale and speed of shipping, depopulating the docks and forcing skippers' families to live on board; 3) the increase in speed and scale led to the restoration of control through nautical media, which then enabled further growth; 4) centralised control brought considerable (sense of) agency and prestige to the state, not only in the military sphere, but also in infrastructure; 5) it was in infrastructure that the need to coordinate traffic led to the (architectural) creation of an overview, which then required nautical media to communicate this information to moving objects.

Unification of the Rhine

For a long time, the commercial regulation of Rhine trade took place locally. Since the Middle Ages, several cities, including Mainz, Cologne and Dordrecht, enforced the right of staple and the right of compulsory transfer (Spaulding 1999; Brand 2011). The former meant that any merchant had to offer the imported goods for sale on the local market first; the latter meant that the goods had to be transferred to a local ship for further transport—by the early 19th century one could pay a fee to avoid the former, but the latter was still enforced (Spaulding 1999: 4). In addition, there were thirty-two toll stations between the German-Dutch border and Strasbourg (Spaulding 2007: 8). For centures, the Binger Mäuseturm (which is still standing prominently on an island in the Rhine) was a toll station, though it probably also had a defensive function as it provided early warning of approaching ships (Will 1875: 212).

French hegemony in the late eighteenth and early nineteenth centuries undermined local power structures, as it had done in the Netherlands with the establishment of Rijkswaterstaat. The first international treaty to uniform the river was the Octroi of the Rhine, signed in 1804, which "dramatically reformed the previously anarchic Rhine tolls and established a truly innovative Franco-German joint administration covering the Rhine from Switzerland to the Dutch border." (Spaulding 1999: 6) The joint bureaucracy that administered the river standardised procedures, improved trade and began to structurally gather river data (cf. Spaulding 1999: 7; 2007: 18).

After French hegemony, the many Rhine states (in the absence of a unified German state) agreed to work together and in 1815 established a permanent Rhine authority called the Central Commission for Rhine Navigation (CCR) (cf. Spaulding 2007: 22). This did not completely end the commercial patchwork on the Rhine—the Netherlands continued to exploit the dependence of the German Rhine states for access to the sea (cf. Filarski 2014: 124), to the extent that partial land routes to Bremen and Hamburg were preferred, even for heavier goods such as wine (cf. Blanning 1983: 24). Under pressure of increasingly powerful Prussia, the Netherlands later caved in and the 1831 Treaty of Mainz included the entire Dutch Rhine delta, which was now free of Umschlagrecht, and with much less toll charged (cf. Filarski 2014: 124). The CCR was given the task of compiling an annual report on the state of Rhine trade (cf. Spaulding 2007: 22), and it became the only authority that could issue skipper's patents for sections of the river, based on experience in those particular waters (cf. Spaulding 2007: 17–8; Filarski 2014: 310). Both of these functions are still carried out by the CCR. The Treaty of Mannheim in 1868 abolished all charges for navigation on the Rhine and its tributaries, with fierce competition from the railways as a major motivation (cf. Filarski 1995: 126).

In the 19th century, the Rhine underwent dramatic changes. In its efforts to unify the Rhine as a trading area, the CCR also sought to improve mobility. As described

above, Rijkswaterstaat undertook major efforts to improve the Rhine and Meuse deltas in the second half of the 19th century. This was not only due to national pressure. During the first inspection in 1849 of the Dutch rivers in the Rhine Delta by the CCR, it criticised the Dutch state, and thus Rijkswaterstaat: "Der Hauptgrund des schlechten Zustandes des Fahrwassers in der Waal und Merwede liegt darin, dass die Niederländische Regierung beinahe nichts zur Verbesserung bisher getan hat." (quoted in Filarski 2014: 132)

It was extraordinary for a sovereign state to be criticised by an international body like that and be susceptible to it too. The success of the CCR is partly explained by the "dramatic expansion of print culture" in the first half of the nineteenth century, first by imagining such an international treaty and building support for it through the circulation of popular opinion, and later by using the new "avenues of communication" to reach "the various segments of the larger public touched by the actions of the CCR" (Spaulding 2018: 17).

Intervention into the river—canalisation and straightening, sections were shortened, currents subsided and deeper shipping lanes emerged—also served public health, as marshlands were drained. The 1817–1876 engineering of the Upper Rhine gave Gottfried Tulla saintly status as the architect of a modern miracle, dramatically shortening the river (cf. Bernhardt 2016). A narrower Rhine, but with a relatively wider navigation channel, was standardised at 230–250 metres in Germany (cf. Lagendijk 2016) and 360 metres in the Netherlands (cf. Nienhuis 2008).

Prussia had long complained about the state of the Dutch section of the Rhine (cf. Bosch and Ham 1998: 115). The Dutch could hide behind budgetary constraints, political instability and disagreements over technical solutions (ibid.). But with the CCR a radically different kind of representation emerged. It can be seen as an 'object-oriented' organisation, an attempt to deal with a common "matter of concern" (Latour 2004: 8–9). The CCR was a way of dealing with the paradox that Rhine policy for the Rhine states was always both local and foreign policy (cf. Spaulding 2007: 6). Rooted both in the unification of the German states through the rise of Prussia and in the subsequent industrialisation, the Rhine became a major German geopolitical issue (cf. Werber 2014).

Mechanisation of inland navigation

In 1824 and 1825, the shipping company NBSM (Nederlandse Stoomboot Maatschappij) made two attempts to navigate the two most dangerous sections of the Rhine by steamboat, one of which was the Bingerloch (cf. Filarski 2014: 85). Newspapers in the Rhine cities reported on the voyages, and the Prussian king boarded the ship that made the second attempt (ibid.). Soon other shipping companies emerged and passenger transport by steamboat was offered along the whole of the Rhine and

across Dutch waters, but the dramatically shorter journeys were not for everyone as tickets were expensive (cf. Filarski 2014: 86). So, despite the publicity, for many people the steamships did not change their lives very much. In the Netherlands, water transport had been the main mode of transport for centuries: it was the "most extensive and reliable network" (Nienhuis 2008: 110), cheaper and often faster than land alternatives (cf. Filarski 2014: 36–43), but still time-consuming, especially upstream, and dependent on horses for towing or wind for sailing. More than steamships, trains made a difference, but even this increase in speed and "shortened time horizons" was an "uneven and partial" experience (May and Thrift 2001: 7, 10). Moreover, waiting remained a key element of the shipping experience—as it still is today. In those days, waiting for a place in a lock, waiting for a new voyage to materialise, waiting for a ship to be unloaded, all took days, sometimes weeks.

After the experiments of 1824–1825, it took two decades for steam to have an impact on freight shipping. Steam tugboats, which had gained strength, were pulling a single file of cargo ships up stream: between 1843 and 1859 the amount of single steam ships remained steady, but the amount of ships pulled upstream went from 11.9 percent to 87.8 percent, as counted at the Dutch-German border (cf. Filarski 2014: 96). During the same period, the percentage of ships sailing independently downstream fell from 94 to 82.5 per cent (ibid).

After 1870, shipping to Germany changed: from small quantities of expensive colonial goods such as tobacco to bulk goods such as grain and ore (cf. Filarski 2014: 114). Subsequently, larger ships were built, international trade on the Rhine increased dramatically, and around 1890 Dutch industrialisation really took off (cf. 119). The loading capacity of the Dutch Rhine fleet almost doubled between 1852 and 1891 (cf. 142). In 1893 the economic tide turned and the Dutch skippers, who dominated the Rhine, suffered from overcapacity (cf. 116), the beginning of a cycle of boom-build-bust-overcapacity (cf. 171). This cycle continues to this day, as I have seen in the field. The collapse of freight rates at the end of the nineteenth century, partly as a result of the continuing liberalisation of the market, forced a further significant change in life on Western European rivers that would last for at least a century: most shipping families gave up their homes on land and boarded ships; wives could take on tasks on board, thus saving on personnel costs (cf. ibid.).

Industrialisation demanded and produced a greater flow of huge volumes of goods. The total tonnage transported registered at the Dutch-German border was 95,000 in 1820 and 30,090,000 in 1910, more than 300 times as much (cf. Filarski 2014: 117). Around 1900 it took 126 workers seven to eight days to unload 6000 tonnes of grain from a (sea) freighter (cf. Schot, Lintsen and Rip 1998: 14–6). With the advent of grain elevators at the beginning of the 20th century, 14 workers could unload the same volume in just two days. Grain was no longer transported in sacks, it had become liquid, homogenised (cf. Bowker 1995: 59–60). In 2016, I joined the *Liberty*, a 135-metre barge on the Mainz, carrying 4000 tonnes of grain destined for Rotter-

dam. The unloading was done in one morning by a crane operator, a sailor and the captain. The former did most of the work (Field note 27.11.16).

Managing distance and proximity

After 1850, mediated control was both a remedy for lost control and a driver to gain more control, both a backlash and an instigator. As scale increased, managing proximity became key.

The scale and speed of transport increased, not only of goods, but also of information. What shipping and railways did for goods, the telegraph did for information. Markets became more international and speculative, with investors dependent on the rapid communication of commodity and stock exchange prices (cf. Bowker 1995: 60; Flichy 1995: 48). Unified markets allowed mass production companies to grow to unprecedented sizes, creating new challenges (cf. Flichy 2006: 193). Organisation and security were at risk—James Beniger claims that an industrial revolution triggered a crisis of control, which was met by a control revolution (1989).

The scale and speed with which things changed during industrialisation led to a lack of control (cf. Beniger 1989). To be fair to Beniger, he defines revolution as a "restoration – although with increasing centralization—of the economic and political control that was lost at more local levels of society" (7). Reclaiming control is not just a matter of new technologies becoming available. The American railway company that JoAnne Yates researched "had virtually limitless access to the telegraph before the Civil War, but used it only to support existing unsystematic patterns of communication." (1989: 272) Serious train accidents brought railway companies to improve internal communication; in fact, complex organisations could no longer afford ad hoc management. The telegraph was essential for organising geographically dispersed action. At the same time, the use of the telegraph for managerial control needed advocacy. As in the Netherlands (cf. Ketelaar 2006: 87), "the single factor most immediately related to the emergence of communication as a managerial tool was the intervention of a strong manager championing the new theories." (Yates: 273)

Yates identifies how simultaneously tighter control was established downwards, with detailed descriptions in standard formats for coordinated action, while to account for the course of events, new "upward flows of communication drew data and analyses up the hierarchy to serve as the basis for managerial control of finances, facilities, materials, and processes." (xvii) To keep up with the new flows of information, new ways of presenting information and improved record keeping were needed. An example of the former is graphs, which require a new kind of literacy to counter the "overwhelming" amount of information at the top (85). In Europe many large companies came, slightly later, to the conclusion that "new organizational memory of rules, regulations, and reporting makes the organization less de-

pendent on individual memories." (Ketelaar 2006: 79) Gradually the latter became a genre used only for external communication; internally it was replaced by the memo. Yates writes that "the removal of traditional polite phases led to clarity and directness to the point of bluntness." (1989: 97) As a result, many companies "discovered the importance of countering the depersonalizing effects of the system with some communication mechanisms aimed at humanizing the workplace (…) thus defusing hostility", for example in-house magazines or meetings (274). Rijkswaterstaat, which employs around 10,000 people, also has a company magazine—now called *Kracht*, which translates as 'strength'.

Centralisation as prestige

The larger trend was to separate decision-making from action, which depends on media. The British navy is a good example. Shortly after John Fisher was promoted from Admiral to First Sea Lord in 1904, he reorganised the British fleet. As documented by Lambert (2005), the advent of wireless telegraphy was the key that enabled Fisher, in a sense a strong manager as Yates and Ketelaar found them, to abandon the delegated command structure, in which every commander-in-chief of a geographical region acted independently. Instead, Fisher centralised command in what soon became known as the War Room. He wrote in his diary of unprecedented agency:

> Neither Nelson nor St Vincent, when in command at sea with their noble fleets, could possibly possess the knowledge of the Admiralty octopus, with its antennae & tentacles feeling everywhere & concentrating knowledge in its brain. (quoted in Lambert 2005: 384)

The omniscient octopus had, a few months later, transformed itself into "a spider's web (…) to devour the German merchant marine and other war apparatus" (quoted in Lambert 2005: 384). More than eighty years later the head of the Dutch (non-military) nautical control rooms told a conference that the operator sat "ever more as a spider—as you know a very useful little animal—in a beautifully woven web. From the centre of his web he has the optimal information to be of service" (quoted in Halma 2004: 64–5).

It is productive to bring the military and the infrastructural control room into one perspective, for they are aligned and opposite. One is elite, the other more mundane, but both rely on the exclusivity of their perspective. Both have come to have a symbolic function in a regime of state accountability. But inland navigation control rooms, of which there are many, operate locally. As far back as the Crimean War (1853–1856), there are reports of complaints about the reach of the London-based high command via telegraph wires (cf. Sterling 2008: xxvi). As a captain, stationed

in Australia, wrote in 1887: "it is too bad that an Admiral can't move about his own station without permission from home—centralisation with a vengeance. It is a great pity, all owing to that tiresome telegraph" (quoted in Lambert 2005: 363). Today, in their remote control rooms, during night shifts, operators and their superiors are a world apart, but they also complain about the loss of autonomy and feel pressure from management. The latter—so the Rijkswaterstaat business manager quoted at the beginning of this chapter told me—had at one point plans to further uniform and delocalise control room practice and ultimately centralise them, going from eleven control rooms to just three (Interview 29.4.16).

Rotterdam—whose port was growing rapidly—probably built the first land-based radar chain, moving further inland to cover the entire port. The network was inaugurated in 1956 by Prince Bernhard, the husband of Queen Juliana. Bernhard was a military man and a macho, an image he carefully managed. The maritime control rooms were usually staffed by former naval personnel who had already become accustomed to marine VHF radio and radar (cf. Halma 2004: 18). For the nautical control rooms, the inauguration embodied a military-civilian crossover that generated much publicity (16). When I visited that control room in 2017, I saw an enlarged picture of Prince Bernhard behind the radar console hanging in the corridor. Inaugurations, Leo Coleman writes, show us the "fundamental relation between social, collective consciousness and political symbols, on the one hand, and the material organization of society on the other" (2014: 459). They are examples of "state imagination" (460). From the outset, the Rotterdam control rooms were also intended, as the planning commission of the time put it, "as an advertisement for this world-class port" (Halma 2004: 13).

Oversight and overview of traffic

The volume and speed of traffic in the twentieth century required oversight and coordination to allow these factors to increase. Oversight was achieved through mediation. The elevated position to create the overview is a first step, bringing architecture into the fold of media. The second step is to communicate the knowledge gained. Air traffic control (ATC) is perhaps the most prominent manifestation of this ambition, although there were practices with similar ambitions on the Rhine in the second half of the 19th century.

Several watchtowers along the German part of the Rhine were involved in traffic coordination (cf. Halma 2004: 280). The aforementioned Binger Mäuseturm was renovated in 1855–56 for this purpose:

> um durch (…) einer sogenannten Wahr-Schau-Station die Schiffer in Kenntnis zu setzen, ob dort ein Schiff auf der Berg- oder Thalfahrt begriffen sei, um dadurch

> jeder gefährlichen Begegnung im Bingerloch vorzubeugen (...). (Cremer 1857: 505)

Skipper Rob pointed it out as we passed it in his 135 metre barge, although he was unaware of its former nautical function (Field note 27.11.16). Flags were used to communicate the knowledge gained from the elevated position: different colours were used to indicate when an exceptional ship, tug convoy or raft was coming downstream, and when the river was free, upstream or downstream (cf. Halma 2004: 280).

ATC towers, like nautical control rooms, are local, territorially limited, manifestations of transnational movement (cf. Denicke 2012). Air traffic control is a response to traffic density, safety concerns (even escalation, such as mid-air collisions) and obstructive atmospheric conditions that emerged in the inter-war period of the 20th century. A first step, like in the Mäuseturm, was to signal to the person controlling the moving object what she or he could not grasp at a distance. One pioneer was Archie League, who in 1929 positioned himself in the middle of the runways at St Louis as a so-called flagman "to direct planes so that they would not collide" (FAA 2011). Around 1932, "[w]ith the advent of two-way radio telephone communication capability in aircraft, radio-equipped airport traffic control towers came into being to replace" flagmen like League (Gilbert 1973: 365). In the early days of air traffic control, there was also an unobstructed view outside; photographs of the time show League wrapped up warmly or under a large umbrella in the summer. However, electronic equipment could not be exposed to the elements. Like the Mouse Tower, the building itself was an important medium in early air traffic control. The idea was to create an elevated position at the critical point, with glass windows providing a panoramic view—these towers became iconic for airports.

Different infrastructure control rooms can be grouped according to the type of traffic they are trying to coordinate. Aviation became schedule-based traffic, like trains, where movement is predefined but still contingent enough to require central coordination. Inland waterways are rule-based traffic, with many independent participants, like road traffic—not united by larger corporate structures like railways and airlines. This is not to say that schedule-based traffic is not bound by rules (train drivers still have to obey a red sign), nor that rule-based traffic is not subject to schedules (docking in ports is planned in detail and port traffic is heavily influenced by shift changes of dock workers). In contrast to schedule-based traffic, rule-based traffic can organise itself to a certain extent, i.e. actors can follow the rules and the infrastructure they navigate is simple enough to allow a certain traffic flow.

1.6. A control room on Devil's Island

The dynamics in which the inland navigation control room in Dordrecht came into being are complex—different actors emphasise different aspects: It is clear that the plans for a control room were 1) rooted in local infrastructural complexities; 2) linked to the rise of large push boats, problems with towing columns and a general increase in traffic; 3) a result of a behavioural turnaround in Rijkswaterstaat's approach to infrastructure, also because 4) public and political support for large infrastructural interventions was declining; 5) encouraged by local politicians as a result of local safety concerns about the rise of tanker traffic; 7) a reaction to the rise of leisure culture and thus many more amateur skippers on the waterways; 8) a way to reduce costs.

Growing infrastructural complexity

From the second half of the 19th century, the various infrastructures—railways, telegraphs, roads, waterways—became increasingly intertwined. Rijkswaterstaat was often involved in this process, although not always from the beginning. Railway transport was initially a private enterprise, but compared to Belgium, for example, the Dutch railway network was rather limited, as the river landscape made construction financially and technically difficult (cf. Bosch and Ham 1998: 80). From 1860, Rijkswaterstaat was given responsibility for planning and supervising a major expansion of the railway network (78).

A proper telegraph network was also only established in 1852 when the state became involved (cf. de Jong and Stout 2007: 93–4), i.e. Rijkswaterstaat (cf. Bosch and Ham 1998: 78). Initially, this involvedthe conception and construction, and later in maintenance of a network that connected "the foremost cities, fortresses and ports." (Brink and Schell 1954: 436) Both telegraph and postal service infrastructure must have benefited considerably from the rail network, as was the case in the U.S.A (cf. Chandler 1977: 195; Beniger 1989: 17): the bridges made it easier to span cables across rivers and for distribution mail to be brought aboard. In 1927, Rijkswaterstaat was given the go-ahead to build a road network for motorised traffic, including twelve bridges over the major rivers (cf. Bosch and Ham 1998: 164). The resulting infrastructural landscape was one of many intersections.

In the 1970s, Rijkswaterstaat had started to layer them when it built two tunnels, one near Dordrecht under the Oude Maas and one further south, under the Dordtsche Kil. The large concrete sections were built elsewhere, then transported over the water and sunk into place—causing considerable disruption to traffic for several years. Another way of disentangling the infrastructure was to standardise the clearance height of bridges, as had been done on the Rhine, so that standard barges could pass. However, the Dordrecht bridge over the Oude Maas became a

bottleneck. From the second half of the 1960s, not only seagoing vessels but also the new, larger push boats were often too high and also needed a bridge opening (cf. Arrondissementsingenieur 1972: 1–2).

Pusher boats were the first to operate continuously to provide the German steel industry with a steady flow of iron ore. With the aid of radar, a key nautical medium, both night and fog were mastered. They were larger than any other ship and initially sailed without a front rudder, which meant that their track was even wider when drifting through bends (Email Filarski 28.10.19). Also, tow columns struggled with the congestion at the Dordrecht bridge and at the busy intersections, especially because it was harder for them to slow down, resulting in accidents (ibid.).

Openings were limited because the bridge was a vital node in the Dutch rail network, connecting north and south. As described above, Rijkswaterstaat reintroduced the Krabbe as a waterway (when it dug the Krabbegeul and dammed the Mallegat), which provided an alternative route for these ships. Not only would the construction of these waterways hinder traffic, but the route itself was "not so attractive", as it would take ships 1.5 to 2 hours longer (Arrondissementsingenieur 1972: 2). "Moreover, part of the Dordtsche Kil (…) should, as a result of strong current and intense traffic, be considered one of the most difficult passages" in the Netherlands (ibid.). The Moerdijk bridges along this route made things even more difficult. As an alternative, a local Rijkswaterstaat report concluded that this route would only work if a

> timely indication can be received concerning:
> a. The number of ships waiting at the railway bridge.
> (…)
> b. The available clearance on the Moerdijk Bridges.
> c. The available clearance on the Dordrecht railway bridge.
> d. The expected strength of the current on the Dordtsche Kil. (ibid.)

It was assumed that ships would need to be informed of local conditions prior to arrival (not unlike early air traffic control informing aircraft). The difficulty with the clearance height—the distance between the water surface and the bridge—is that it depends on the water level, which varies around Dordrecht not only because of the amount of water flowing downstream, but also because of the tides. A control room could provide this time-critical information.

Rijkswaterstaat in transition

In the 1950s and 1960s, Rijkswaterstaat had "reached new heights of power and expertise" (van den Brink 2010: 77) and was considered the "ruler of the delta" (Ham quoted in van den Brink 2010: 77). Rijkswaterstaat's response to the devastating

floods of 1953, the Delta Works, a large-scale system of dams and floodgates, brought it international fame. According to Van den Brink, this success "enabled the institutionalisation and hegemony of a technocratic system of meaning" (78). This was reversed in the 1970s, and the 1972 report quoted above seems to be an early example of this. It does not propose major interventions, but seeks to postpone them. Larger developments in the 1970s and 1980s—"the rise of the environmental movement, the democratisation of Dutch society and (…) the rise of neoliberal (…) ideology" (79)—made control rooms fit right in.

Ruud Filarski—an engineer who was a senior Rijkswaterstaat employee in the 1970s, directly advising the responsible minister and involved in major policy developments—said that at the time the agency "saw that the civil engineering solution was no longer working" (Interview 7.1.18). Its plan to rigorously redesign a dangerous section of the Waal (a Dutch continuation of the Rhine) was rejected because the people affected, also motivated by environmental concerns, no longer readily accepted Rijkswaterstaat's solution (cf. Filarski 2014: 320–323). The authority of the agency as sovereign experts had begun to crumble, and so other ways of legitimising action had to be found. In 1975 the Dutch parliament told them as much when it recognised the need of "a better alignment and consideration, both within waterway policies and in relation with other societal sectors" (quoted in Willems, Busscher, and Arts 2015).

Legitimacy was to a large extent a local matter. Filarski recalled that in the 1970s, mayors of towns near busy waterway intersections lobbied for the control rooms (see Interview 7.1.18). The public perception was that tankers carrying chemicals were "floating bombs" (Filarski 2014: 311)—a notion rooted in a fatal accident in the preceding years. Rijkswaterstaat documents from the time also mention this concern (cf. Benedenrivieren 1976). The island of Dordrecht, Zwijndrecht to the west and Barendrecht to the north were all suburbanising (cf. Brand 2012), surrounded by shipyards, ports and chemical factories. The Dordrecht control room was meant to serve not only the skippers, but also the people living nearby—in the 1980s, the local press became the platform for communicating this, much like Twitter is today.

In general, what the agency has built since the 1970s has been mainly 'dry' infrastructure, such as motorways. Locks are now obsolete, most of them built in the 1960s, and smaller canals have been designated as off-limits to the larger barges, rather than being widened. Gradually, the focus has shifted from the medium term to the short term, and budgets and attention for waterways have gradually declined (cf. Willems, Busscher and Arts 2015). With the rise of neoliberalism, the direction of policy took a behavioural turn, which is still regularly advocated by policy advisors I speak to. Instead of building, the focus shifted to the users of infrastructure. The aim was now to use the existing infrastructure more efficiently. This was also a budgetary issue as the economic tide turned in the 1970s. Efficiency and budget cuts operate in a circular causality, both can be cause and effect.

The 1972 report on the need for a control centre in Dordrecht stated that

> it can be put forward that a well-equipped guiding post makes it possible to use the waterway network more optimally, as a result the safety of shipping will be improved and unnecessary time loss prevented. Moreover, investments in waterways, which would be required without the presence of such a post, can perhaps be postponed for a few years. (Dordrecht 1972: 1)

In this way, the efficiency for the skippers is aligned with the efficiency for Rijkswaterstaat, since costly infrastructural interventions can be avoided and a smooth flow of traffic can be achieved with the same measure.

River masters at the frontier of changes

The behavioural turn that Rijkswaterstaat took with regards to waterways, was also a reaction to the rise of leisure culture. More and more people had the spare time and the financial means to buy a sailing or motor yacht, and during the summer months the waterways were crowded. Until then, the waterways had been used almost exclusively by professionals. In their meetings, the river engineers of Rijkswaterstaat expressed their concerns (cf. Sijbesma 1969). Since the mid-1960s, they had created a new position, the river master, who, with their patrol vessels, were the uniformed presence of Rijkswaterstaat on the water (cf. Stuulen 1965). They were expected to compete with the water police as primary waterway authority and for public recognition of officials ensuring safety, which the river masters readily did (cf. Stuulen 1967; Centen 1972).

The river masters were closely involved in the introduction and regulation of marine VHF radio and radar in the professional fleet (cf. Centen 1975). The minutes of a national meeting of river masters in 1973 describe how they foresaw that the construction of an additional lock near Nijmegen, just after the junction of the Waal and the Maas-Waal canal (a major shortcut on the Belgium-Germany route), would create 'a great demand for a permanent post to inform ships and for communication' with the existing lock, as there was limited space for ships to moor while waiting for an opening (cf.. Secretaris 1973). The same minutes mention that there would be "a permanent radar post" near Dordrecht, "which will be permanently staffed by a river master" (ibid.). Apparently the word in the organisation in 1973 was that a control room in Dordrecht was a sure thing, and that river masters were expected to staff it. A concrete proposal was made at the beginning of 1976 and approved by the competent minister at the end of that year (cf. Directeur-generaal van de Rijkswaterstaat 1976; Benedenrivieren 1976).

The new focus on cutting costs also affected the river masters: the idea was to use the control room to centrally direct the patrol vessels (Interview 7.1.18). This

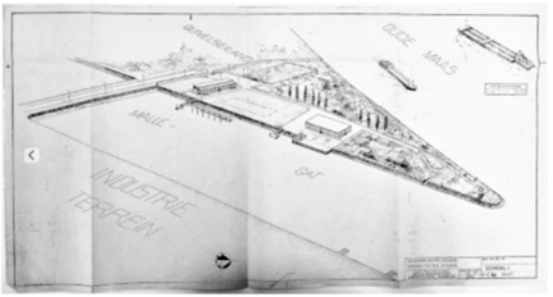
centralisation meant less patrolling and more directed manoeuvres, resulting in a significant reduction in the number of patrol vessels and crews, with consequent cost savings (ibid.). The idea was to have a mediated presence through radar and CCTV. In the hierarchy of Rijkswaterstaat, the operators were placed above the river masters. When Fisher had his War Room up and running, he did something similar: he changed strategy from patrols to manoeuvre, trading the autonomy of his fleet, which until then was busy to demonstrate its presence, for directed action, controlled from the top (cf. Lambert 2005).

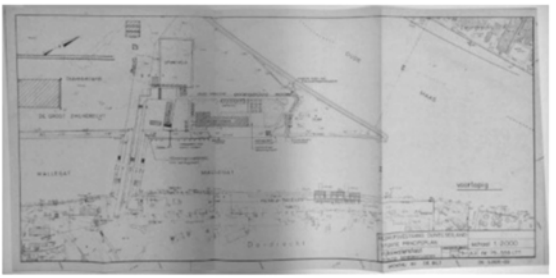
Conceptual development of the Dordrecht control room

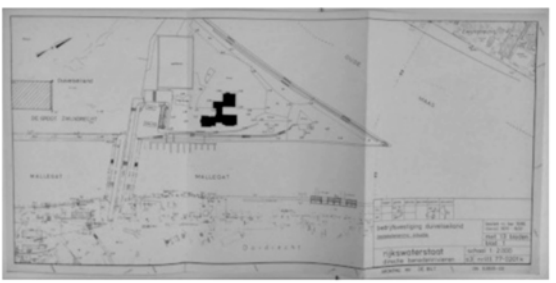
In the 1972 report, Devil's Island was suggested as a location because 1) it provided a view of the traffic approaching the railway bridge and the junction of the Oude Maas—Dordtsche Kil, 2) there was land available on which Rijkswaterstaat could build, 3) there were plans to house other departments there (cf. Arrondissementsingenieur 1972: 10–1). Above it was shown that it largely lay bare because Rijkswaterstaat had only just elevated it with the ground it dug out for the newly formed Krabbegeul. At one point the island is referred to as 'Krabbe Island', but otherwise Rijkswaterstaat's use of 'Devil's Island' is fairly consistent over the decades (ibid.). In the early 1970s, when the newly formed South Holland waterway district, was in dire need of new offices, both Rotterdam and Dordrecht came into consideration (cf. Directeur-generaal van de Rijkswaterstaat 1973). The mayors of both cities lobbied hard for the decision to be made in their favour (cf. Lee 1973; Thomassen 1974). Devil's Island was also considered as a location for the district offices, but the head of government buildings preferred the "vicinity of public transport and (…) an urban environment with shops and the like," Devil's Island was "way too much isolated and near an industrial zone." (Wuis 1974)

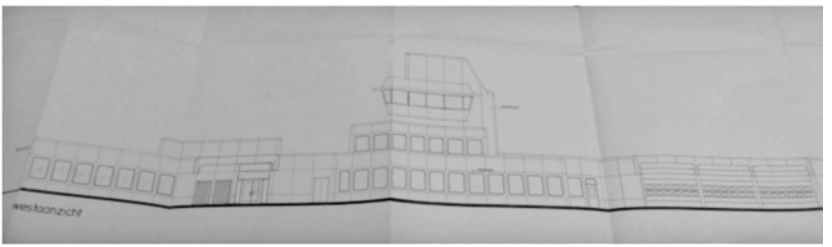
The progression of the drawings shows how the initially separate buildings became increasingly integrated. In a 1975 perspective drawing, the one I tweeted about, there are three buildings, one of which is a small tower for the control room to the east (Figure 20). In a 1979 map, the control room tower has moved north and the other two buildings have moved closer, one of them considerably larger (Figure 21). In both cases, the tower is directly on the water. In the final plans of 1979–1980, all the buildings are integrated, with a control room at the top on the second floor (Figure 22 and 23). This is not particularly high, but photographs of Devil's Island from the early 1980s show hardly a tree in sight—less than ten years before the land was raised when the Krabbegeul was dug. The accompanying documents make it clear that the plan from the outset was to involve other external departments: those who controlled water quality and needed laboratories, maintenance crews who replaced and repaired buoys and signs, river surveyors who sounded the riverbed, and the river masters with their patrol boats.

Figure 20: The 1975 perspective drawing of the building plans on Devil's Island. Figure 21: The 1979 layout of the plans for Devil's Island. Figure 22: The 1979–1980 definite layout of Devil's Island. Figure 23: Side view of the black shape in the previous figure.









A 1979 communiqué by the agency informed skippers that the "post is at service to shipping on the waterways around Dordrecht" (Hoofdingenieur-Direkteur 1979). It would deal—not yet 24 hours a day and without radar—with the observance of navigation rules and act as a "control post from which, in order to increase safety, navigation is assisted with information and advice, possibly with sailing instructions" (ibid.). A 1983 report defines the work: "[w]ith help of radar […] and TV […] traffic information is supplied to the waterway user and permanent surveillance of the traffic development takes place within the coverage area" (Zanten 1983: 1). The goals are "guarding and accommodating a swift and safe traffic development, in cooperation with the patrol boat" and "to contribute to preventing shipping accidents and reducing the harmful consequences for passengers and ships" (ibid.).

Establishment of a control room on Devil's Island

The control room was primarily aimed at the users of the waterways and was built in the knowledge that this public had diversified. At the same time, its very presence embodied a promise to another public: those who live near the waterways and are concerned about what passes by their houses day and night. To this end, every few years the local newspapers would report on a visit to the control room. One article brings together many of the issues discussed in this chapter.

In 1984, two years after work began on the island, a free regional weekly newspaper with a circulation of 1.2 million ran a major article on the Dordrecht control room. The Dordrecht control room was placed in the tradition of more established infrastructure control rooms: "the building looks a lot like a smaller version of the air traffic control tower at Schiphol" (Hemsbergen 1984), the largest airport in the Netherlands. The article was entitled "Cameras and radar guard shipping intersections", emphasising the technology rather than the operators (ibid). Nautical media are presented to a wide audience. Four photographs were included: one of the operator from behind, one of a radar sensor along a waterway, one of a radar screen and one of the journalist with the two managers in charge of the control room. The operators are not quoted, but the managers are. One of them says that "with this system, we increase the safety of shipping and the people living nearby" at "the busiest inland navigation junction in the Netherlands" (ibid.). He added that the patrol vessels "can now be used more efficiently" as they "no longer have to keep an eye on the crossings" (ibid.). By 1984, efficiency seems to be more than just an internal organisational logic. It was now also an argument for public legitimacy.

As for the registration of Devil's Island: the subtitle of the article is "Control room on Devil's Island informs sea and inland navigation". The first sentence hammers it home: "Day and night, the control room on Devil's Island in the Oude Maas keeps an eye on the shipping traffic around Dordrecht." (ibid.) While the origins of the name of the island-turned-peninsula are hard to pin down, it was only after Rijkswater-

staat solidified Devil's Island and started operating from there that records of the name became more frequent. Before that, the name Devil's Island was handed down informally.

However, it is also an order that I am handing down, which contributes to the enrollment of Devil's Island by recording its enrollment. Therefore, the enrollment cannot be a linear process, as I can revisit the past and thus introduce another feedback loop.

1.7. Conclusion

In this chapter, I have covered a history and how it is tied to the present, or how the present is deeply ingrained into questions asked of the past, which is a line I will continue to pursue in the next chapter. Here, it started with the history of the name, in which operators' and ethnographer's interests conflated. The search for the explanation of the name of a place was done in the context of the long Dutch history of give and take between water and land, which on the one hand defies the nature-culture opposition, but on the other hand, at least as an idea, relies on it. In practice, this meant that while the common narrative is, both reproduced about the Dutch and by the Dutch, that land was won, and water controlled, water and land actually shaped each other in a process where it is hard to tell what started what. Though rivers remained alive nevertheless, it is clear that human manipulation grew more successful.

Even then, the infrastructural history told here shows that the focus on the creation of land is insufficient to explain how Devil's Island came about. Though this did not happen as a singular event, but instead consisted of many incremental steps, it is clear that the island (first a mudflat, ultimately a peninsula), is a by-product of waterways. Because I reconstructed this process using (mainly) cartographic sources, I could only pick up this history from the oldest map I found. From this, we have learnt that what would later become Devil's Island was severed from land to create the Nieuwe Vaart, later called the Mallegat, and that it was cut in two when the Krabbegeul was dug and elevated with that soil. This story had, in the way it has been told here, four main protagonists. The 1) ethnographer picked up what he thought was a question 2) operators wanted him to solve, which led to 3) rivers being turned into waterways, into 4) infrastructure and thus 5) brought Rijkswaterstaat into play.

It turned out that in search for an explanation as to why it was called Devil's Island, its origins are less interesting than the history of its enrolment, in which Rijkswaterstaat played a large part. While I could not really convince operators of my hypothesis, it allowed me to foster ties, initially via Twitter and which eventually through conversations in the control room. The theme showed me how operators are

also in geographical references, are still engaged in shipping culture, in the tradition of handing down geographical orders, and integrating their control room in it.

The enrolment of the name Devil's Island is actually part of the Dordrecht control room history; it was the context in which it was enrolled. This history is grasped in two steps. First, in section 1.5, a history of mediated control and mobility is reconstructed. Five elements were key here: 1) the unification of the Rhine as a commercial zone and a stabilised waterway, from which in the late 19th century by 2) an increasingly mechanised fleet benefitted, but the creation of this infrastructure itself depended on mechanisation too; 3) with an increase in scale and speed that this enabled, control and thus safety became an organisational challenge, which was met with the centralisation of information through media; 4) this brought a new sense of agency and prestige exploited to increase organisational legitimacy, which is a recurring phenomenon, addressed in more detail in chapter three; 5) the new infrastructure control rooms that emerged made it possible to keep up with changes in mobilities as well as spur on the increase of scale and speed in traffic.

In a second step, the early history of the Rijkswaterstaat control room in Dordrecht—for which problem the was control room to be a solution?—is reconstructed. It turned out that there were a lot of reasons, of which I want to highlight four here: 1) ever larger and quicker ships sailing through the night, made possible by the introduction of radar in inland navigation; 2) local political pressure to oversee this trend, including the rise of tanker shipping; 3) Rijkswaterstaat's fading authority to initiate large infrastructural interventions and 4) the subsequent reduced funds. These are important because, in the case of the first reason, the first generation of operators came from those ships sailing night and day, where they learnt to use radar, central to the next chapter. The second reason is significant because the local pressure for permanent oversight is the basis for what in chapter three are the efforts by operators to be accountable locally through Twitter. The third reason marks the start of a new episode in infrastructure history, in which efficient use is prioritised over physical intervention. Thus, in the early 1980s, the investments in the Dordrecht control room and others marks a new field of action for Rijkswaterstaat. This trend was quickly solidified by the turning economic tide and the rise of neoliberalism, the fourth highlighted reason. What is particularly remarkable here is that despite its reputation to be on the frontier of technological developments, to be state of the art, control rooms were comparatively cheap, they were also a way to save money.

The 1976 proposal for the Dordrecht control room contains the oldest mention of the motto of the nautical division of Rijkswaterstaat that I could find (Benedenrivieren). The service-oriented "safe and swift", as still uttered in the field today, represents both a long held Rijkswaterstaat desire to advance the Netherlands economically while safeguarding it, dating from the mid-19th century, and a post-1970s pre-

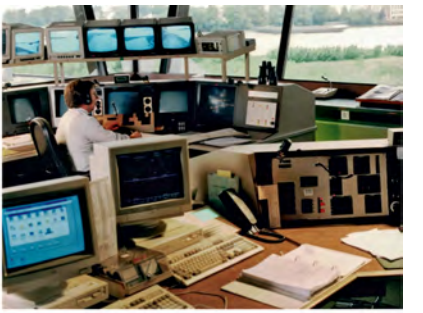
occupation with efficiency amid a retreating government. One that believes it should provide the (safe) conditions for the increasingly revered market.

Rijkswaterstaat long "solicited admiration" as a "brainy" organisation, one mid-level manager with two decades of experience in the organisation said (Interview 29.4.16). In the 1990s, he was hired as part of the first generation of "surroundings managers" (ibid.). The large infrastructural interventions Rijkswaterstaat still undertook required patient integration of local publics in those projects from an early stage. Tellingly, one of the largest projects Rijkswaterstaat took on in recent years was called Room for the River, in which rivers were given back space in order to digest the larger volumes of water that come with climate change. For people living in the designated areas it was difficult to figure out a new sense of safety now that for them the modern land-water distinction was about to be abandoned (cf. van den Brink 2010, 186–9).

In the Dordrecht region in the 1970s the search for legitimacy resulted in an approach focussed on infrastructure use as observed and coordinated through media. As with all infrastructural and organisational control rooms, the Dordrecht control room was both a reaction to changes in scale, speed and infrastructural complexity, and as a facilitator of those very changes.

Chapter 2 – The Mediatisation of Work

Figure 1: Photograph of Dordrecht control room, taken in 1986 by the now retired operator Dirk Zwijnenburg. Figure 2: The same control room in 1995, taken by Rijkswaterstaat. Figure 3: 2018 photograph of still the same control room, taken by author during a field visit.



As I write these introductory words, in the late summer of 2020, Rijkswaterstaat has abandoned Devil's Island. The operators were the last to work in an otherwise empty building. The others have moved to a new office in the old town of Dordrecht, within walking distance of the train station. Much of the work done by the outdoor department on Devil's Island had long since been outsourced, and many of the workshops were already unused. The operators moved to a nearby building, also on the Oude Maas, between the two crossings. Before the renovation, it was the control room for the tunnel under the river, with most of its windows facing away from the river, on the side of the tunnel opening. The view from Berlin, where I am writing

this, is that they seem quite happy with their new workplace. Rolph has been providing regular updates on the renovation via Twitter. At the inauguration, several Rijkswaterstaat patrol boats and a police boat stood in formation on the Oude Maas just below the control room window, honking their horns. Rijkswaterstaat's communications department had used drones to capture the event, which Rolph tweeted (2020). The regional newspaper paid close attention to the move. In the article, Rolph said they were happy to be back on the water: "When push comes to shove, you still want to be able to see for yourself. Nothing beats the naked eye" (Koster 2020).

This move would then be a great opportunity to tell the story of Rijkswaterstaat's work on Devil's Island from start to finish. I had heard rumours that Rijkswaterstaat was keen to sell the large piece of land, which is well placed for industrial and nautical activities. This could be the story of Rijkswaterstaat moving from water engineering to infrastructure management to property investment. Others, however, were not so sure that it was Rijkswaterstaat's land to sell in the first place. If you focus on the scandalous, you can get sucked into a quagmire and lose sight of more mundane but more meaningful changes.

Moreover, to reduce it to a Rijkswaterstaat story would be to ignore the fact that there was another agency working there: the Directorate of Shipping and Maritime Affairs (DGSM). In the early days of the Dordrecht control room, two operators worked in shifts: the radar operator was employed by DGSM, and the other, who assisted skippers on a different marine VHF frequency and was not qualified to use the radar, was employed by Rijkswaterstaat (Interview 5.1.18). The DGSM was, now DGLM, the state organisation for nautical policy, also concerned with piloting,[1] and for people in the field historically linked to the Dutch navy.

Although I cannot do justice to the organisational rivalry between DGSM and Rijkswaterstaat, it is part of a larger theme that connects much of the work of the operators on Devil's Island and the changes that this work has undergone. This is linked to what Rolph said in the local press. From talking to Dordrecht operators over the years, I know that operators have fought long and hard to keep a direct view of the water. In a private email, one operator, when asked how he likes the new control room, mentioned the "very beautiful view of the Oude Maas." (Email 4.9.20)

Phrased this way, it sounds like a senior manager coveting a corner office and praising the view once it has been achieved. In fact, the head office of Rijkswaterstaat's shipping department is right on the Maas in Rotterdam, on the umpteenth floor. Whenever I have been there to interview senior staff, I have been impressed by the view of the port and the city. But for the operators in the Dordrecht control room, and for many of the operators I met in other Rijkswaterstaat control rooms, a direct view of the water is not associated with power or luxury, but with their former work as skippers. From the wheelhouse, a panoramic view of the water enabled

1 "Lotsen" in German, "loodsen" in Dutch.

them to observe the river, the weather and the traffic. Although today's wheelhouse has large consoles packed with interfaces, I have seen older skippers only turn on the radar display at night or in fog.

This is not to say that skippers-turned-operators are averse to media, but they have learned to navigate and understand the variables that guide shipping by looking outside. The first generation of Dordrecht operators were almost exclusively former skippers, and they still make up the majority. It has often been argued by operators that this experience, together with a direct view of the waterway, is crucial to the successful coordination of traffic. Knowing the local conditions is one thing, understanding how a vessel behaves and what information a skipper needs is another.

However, one operator in the control room at the port of Antwerp disagreed when we mentioned the need for maritime experience: "air traffic control is not done by ex-pilots either" (Field note 7.4.17). In fact, none of the German, Dutch or Belgian state organisations that operate control rooms for coordinating traffic between Duisburg, Rotterdam and Antwerp—the world's busiest inland waterways, as is regularly claimed—require their operators to have shipping experience. But in Rijkswaterstaat's control rooms, operators find it difficult to take anyone seriously who is not a former skipper. Almost every work-related utterance, usually from one of their superiors, can be legitimately dismissed, at least in the eyes of the operators, with she or he 'has never sailed'.

A direct view of the water is also no longer guaranteed. Many operators have no view of the area they monitor other than CCTV and radar, overlaid with nautical charts and a geolocative system called AIS (Automatic Identification System). This is because different crossings, called 'sectors', are often centralised under one roof and operators rotate between them every few hours, changing consoles. All the control rooms still have a direct view of the water, usually a magnificent panoramic view, and are located at the heart of busy ports or busy intersections, but only one sector has a view that actually corresponds to its interfaces. In practice, the view of the water is still used: binoculars are plentiful, operators use them every shift, often huddling together, looking across the water and discussing the event that has caught their attention. Operators say the view allows them to consider many variables at once—draft, visibility, wind, cargo—to assess a vessel's manoeuvrability. However, when I followed a cohort of future operators through their formal training, neither binoculars nor a direct view of the waterway were ever mentioned, as training is done on simulators.

The difference in understanding of operator work—what an operator should know and be able to observe in order to do the job—between those doing the work and their superiors is remarkable. So instead of trying to explain how Devil's Island was abandoned again, I looked for an explanation for the different understandings of operator work. This would best explain the publicly expressed tensions between

operators and management that drew me to the field in the first place.[2] How did skippers become operators, what changed for them when they did, why did the organisation recruit skippers in the first place and, most importantly, how could this experience be declared irrelevant? I found out the answer lies in the informal training of skippers, the efforts of skippers-turned-operators to professionalise, their rivalry with pilots at DGSM, the rise of managerialism, much of which comes together in what I call the mediatisation of work.[3] The three photographs that open this chapter (Figures 1, 2 and 3) illustrate how the number and size of screens increased, shifting the operator's gaze more and more towards the interfaces and away from the control room windows.

This chapter is divided into six parts: the first has a methodological focus and introduces the diversity of sources and their materiality as part of the field, which is more than an anthropological projection and reflects how actors were historiographically active even before I mobilised them for this project; in the second part, former skippers tell how they became operators (now retired), which highlights the community of practice they were part of and the mode of learning they brought to the control room. The third part then discusses early control room work—with a special focus on the control room kitchen—and how what appeared to be start-up problems actually persisted for decades; the fourth part describes and analyses the professional rivalry with pilots that manifested itself early on; then, in the fifth part, the formalisation of control room work, from the early autonomy afforded by the media setup, to how the mediatisation of control room work allowed the locus of training to shift to simulators, unsettled the community of practice, and undermined the relevance of the direct view of the water, allowing for the centralisation of control rooms; finally, the sixth part discusses the role of managers, both by looking at how Rijkswaterstaat became managerialised and how the professionalisation of managers automatically excluded operators from achieving the same status, a fate sealed when scandal-hit Rijkswaterstaat decided to become a 'network manager' and needed operators to fall into line.

2.1. The anthropological interest in historiography

From an anthropological perspective, historiography has never been far away, or should not have been a separate entity in the first place (cf. Evans-Pritchard 1962).

2 Although I understand it as the main, underlying cause of the conflict, there are different aspects to it. I will highlight those along the way, but do not claim to fully cover all the dimensions of the conflict.

3 Parts of this chapter were taken from my article "Mediatisation of Work" (Boersma 2018) and reworked and elaborated upon.

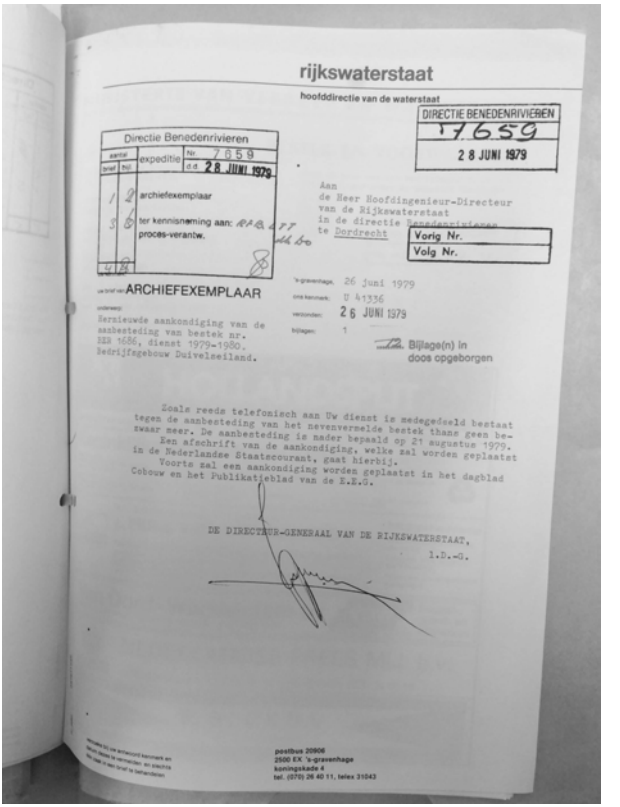
The previous chapter began with Jens Wietschorke's emphasis on how the past is present, and how the past itself was once a present. Here we continue in that vein. Diane Vaughan wrote that historical anthropology "studies the way ordinary people in other times and cultures made sense of things" (Vaughan 1996: 61). For me, to study history anthropologically is to engage with a variety of epistemological sensibilities. Classically, the anterior interest of anthropology was about "the before", a colonialist dream of times untainted, also by anthropologists themselves (Cohn 1987: 19). Although the context is different, the credibility of the source is not necessarily enhanced by the perceived absence of the researcher during its production. To you, the reader, I, the researcher, am very much present in these documents when I present them. One must therefore be sensitive to the present from which the past is being researched and by whom. From this it follows that when one embarks on an oral history project (as we are about to do), one must be aware of the presence from which the past is remembered. The third sensibility is to account for how the past has tried to give shape to how it is understood in the present. What follows is an overview of the sources I have worked with in the light of these three points.

Archives: structured absence

As far as I could tell, there were two archives, both state-funded, that held documents that could provide evidence of organisational meaning making. Before the documents ended up in these archives—mainly from the 1970s and 1980s, as the 1990s are not yet available—they passed through many different hands. The journey of these documents includes at least three moments of storage—1) by an employee who filed them in a cabinet, then 2) handed them over to the central archive of the agency for internal use, and 3) the handing over of parts of the archive to a public archive as part of a Dutch law on the keeping of public records—three moments in which someone wondered what to do with them, which implies that they had an idea of for whom they were keeping the documents. It is safe to say that none of them had an ethnographer in mind. In my experience, to borrow from Tracie L. Wilson, archives are more attuned to the historian's why question than the ethnographer's how question (2012).

Another source of historical documents is the public online database of the Ministry of Infrastructure and Environment, to which Rijkswaterstaat belongs. The selection of Rijkswaterstaat documents for publication appears to be made, among others, by the historian working for the "Corporate Service" of Rijkswaterstaat, whose task it is to promote the production of historical knowledge that "can be learned from in the light of organisational development" and to prioritise public disclosure (Toussaint 2010: 33). Through the database, official reports are made public, such as the 1976 proposal to build a control room in Dordrecht (Benedenrivieren 1976).

Figure 4: A letter approving the public tender for the construction on Devil's Island, with the original signature of the head of Rijkswaterstaat, made for archiving, processed two days after it was sent to the head of the local division responsible for the Dordrecht control room.



Harold Garfinkel once researched "Good Organisational Reasons for 'Bad' Clinical Records" (1967)—he could do this while he was close to the fire, the people who made the records were around. Years before he had helped conduct experiments that highlighted, as Michael Lynch puts it, the "interpretative flexibility of retrospection," as it was claimed that the experiments showed that any narrative could be found in random documents as long as the participants wanted to (Lynch 2009: 92). I could certainly manage to find a narrative in the six per cent of all documents, which is the percentage that the National Archives has passed on, through the intermediary of the State Archives, an archivist told me. Garfinkel suggested, according to Lynch, 'that such flexibility was anticipated and to some extent prospectively managed when the records were written and assembled' (ibid.).

My impression from what I found in the government archives is that they are a testament to the achievements of the government organisation and the particular regional department to which the Dordrecht control room belongs. Important decisions seem to be those with significant financial or organisational consequences. Most documents are signed with a (senior) function, not a name, or by people with academic titles. This idea of top-down accountability is manifested in individual documents (Figure 4). In the letterheads of the central board of Rijkswaterstaat in the 1970s and 1980s, the archive is one of the standard options for the recipients of the letter. The archive is addressed directly at the top. The "hegemonically inflected nature of the surviving evidence" (Uricchio and Pearson 2002: 75) refers both to the documents and to what remains of them as a whole.

However, it is still quite difficult to assess what was left out and how the records were managed prospectively. Ironically, this would depend on the interpretive flexibility of retrospection, of which the notion of 'accountable achievements' introduced above is a manifestation. This in turn invites speculation about the motives for recording: Is it a form of transparency that serves both the public and careers? A genealogy of this particular inherited order thus remains elusive. But it is clear that the control room story that can be told with these archives hardly covers the operators' perspective, because there were no records of anything that looked like daily control room work. There is a structured absence.

Situating oral history

Some of the now retired operators who worked on Devil's Island for decades kept private archives. I was lucky enough to find Dirk Zwijnenburg's archive still relatively intact, mainly covering the period from the late 1970s to the late 1990s (the latter being a decade not yet available in official archives). The decisive factor in whether such archives survive or shrink drastically, apart from the death of the archivist, seems to be whether or not the now retired operator has (yet) moved from a family home to an apartment—in the Netherlands, as elsewhere, many retired people choose to live on a smaller scale. Several times I was simply too late and there was not much left. Frans Heijlaerts, another retired operator, and his wife returned to live on the water, which they had left three decades earlier for a family life on land, including a job as an operator. They renovated an old barge into a house and now sail the European waterways (Interview 4.1.18).

The remaining archive was generously made available to me. Dirk and I went through it together and what I was interested in I was able to take home with me. Dirk is now in his 70s. He was a skipper for the first 15 years of his working life, then moved to the control room and is now retired, although he has continued to work as a captain on a cruise ship on the Rhine. Pictures of old ships fill the walls of his house, and an anchor lies in the front garden. Someone who has collected,

partly (co-)produced and ordered the documents for the historiographer is quite a luxury—at least for the kind of bottom-up, practice-oriented research I am aiming for. I was free to roam, but I was also alerted to documents of interest that I might otherwise have missed. Dirk had archived photographs of older control room setups (Figure 1). The value of these photos was greatly enhanced by the fact that the person who had worked there could describe what was actually depicted. More than identifying the equipment or giving details of the manufacturer, Dirk remembered how it was used. He had also kept many newspaper clippings in his control room over the years.

At first it seemed that Dirk's private archive was less prospectively managed than the official archives: Dirk's archive did not automatically have an audience. After I had interviewed Dirk, he called to ask if he could come by my hotel and bring me a book he had mentioned. It was early January, but Dirk came by bike—he had told me that he had commuted by bike all his life, and that the money they saved by not having a car allowed them to visit their family in Australia every few years. On a blank page he had written a short text and signed it. The history of the Dutch vessel traffic service, as described in the book, was based on material provided by Dirk and other former operators' archives. This is not to say that they knew all along what they were archiving for, but there is a clear correspondence between the operator's perspective of Dirk's archive and the book, which the operators financed themselves, because otherwise their perspective would not have been made public.

The book, which translates as *The Past as Building Block of the Present*, is written by Goffe Halma (2004), a former operator in the port of Rotterdam. As the title suggests, it is an attempt to explain the inherited order in which operators work today. It is also about the struggle the operators went through to try to pass it on on their terms. Halma, to invoke Lindqvist, dug where he stood and Dirk helped him. Lindqvist's book was translated into several languages, but never into Dutch, and the History Workshops[4] that emerged in Sweden in the 1970s and in Germany in the 1980s never really reached the Netherlands, where amateur historiography, like so many things, rarely became a real site of social action. Lindqvist believed in the authority of ordinary workers: "working experience is the platform on which they can stand," and "when they are talking about your job you are the expert." (1979: 26) Lindqvist further points out that "most documents need an oral complement to tell their whole story" (Lindqvist 1979: 28).

In its representation on these pages that voice is lost, as paper only allows for transcripts, as Portelli has noted (1981). Similarly, variations in rhythm, "thus ex-

4 These go back 1967, when Samuel organised the first History Workshop at Oxford's Ruskin College, which would continue to pursue a history from below for over two decades (cf. Samuel 1981; Davin/Parks 2012). From the 1970s onwards, participants, who could be non-academics too, were invited to start their own local history workshops (cf. Parks 2012).

pressing variations in the narrator's attitude towards his or her material (…) can only be perceived by listening, not reading." (ibid.: 97–8) Later in this chapter, I have sometimes included my "response tokens" to show the "interactional home" of the utterances (Silverman 2017: 149–53). It is clear that Dirk is inviting them, but I am also encouraging him. Where possible, I try to show what made an interviewee speak the way he did, rather than erase my presence, especially when there was a ping-pong kind of interaction. However, readability is hampered by such inclusive presentation. The challenge, therefore, is to strike a balance between what I want to cover and how I present it. The result is increasingly concise quotations as the analysis becomes more abstract as the chapter progresses. This inevitably brings me close to the classic pitfall of ethnography: speaking for the field and positioning myself as an expert, as opposed to letting the field speak for itself. One way out is to highlight the divergent interests and languages of the field and the researcher. The terms in which I study the conflict and the discussions to which I want to contribute are academic, largely alien to the field.

Portelli also emphasises that "oral sources are narrative sources", which require sensitivities developed in literary studies, as the difference 'between the duration of the events described and the duration of the narration' varies (98). In general, "there is a relationship between the velocity of the narrative and the meaning the narrator has in mind". (99) These narratives do not "reveal" the self, but "create selfhood through narrative or biographical work" (Atkinson and Silverman 1997: 320). So, a degree of caution towards the "revelatory power of the narrative" is in place (317). Through my questions aimed at reconstructing a working life, I invited participants to construct biographies.[5]

"Oral sources from non-ruling classes are linked to the tradition of the folk narrative," which might result in "narratives where the boundary between what takes place outside the narrator and what happens inside, between what concerns him or her and what concerns the group, becomes quite thin" (Portelli 1981: 99). In the case of this study, this is a slippery slope as it places the author in a delicate position. All the operators I spoke to had previously been skippers, and although all had some formal education, they often started sailing at a young age, a profession that relies heavily on oral communication. All are literate, but none is as comfortable with written language and academic jargon as former senior manager Ruud Filarski. Some were said to have struggled at school.

It may seem that placing the operators in a folk tradition devalues the claim to truth in their statements and is condescending. This is not my intention. One contrast that became apparent when talking to operators in the field, beyond the oral

5 Of course, Bourdieu contested the validity of the biographical narrative as the basis for identity (2004).

histories reported in this chapter, was that operators spoke much more of a collective work history than those in higher positions, who tended to emphasise individual career paths, including changing roles. Furthermore, a distinction often made, not only by operators but also by skippers, is that between "practitioners" and "theorists", with anyone with a university degree who is not involved in carrying out practical, physical tasks being labelled a theorist (Field notes 6.2.16, 12.10.18). No field provides a neutral position, and in this field, actors laboured actively to win me for their cause. Although I have always tried to deflate such expectations and to remain at arm's length, I can now say that I felt and feel more aligned with the operators than with the managers and policymakers, as is perhaps evident from the references to the history workshop. It is the responsibility of the researcher to be perceptive of the pressures those with less power are exposed to. Nevertheless, I was heavily reliant on the operators to share their knowledge and work with me. I had little to offer in return. Their superiors, on the other hand, were less welcoming and had their own access to researchers, mostly from technical universities, who could validate anything they claimed, or at least offer neat quantified results.

While I had found Halma's book only after I had started the oral history, I knew about the official history of Dutch inland navigation and waterways from a Dutch academic colleague who had recommended it. It was written by Filarski and commissioned by the Corporate Service of Rijkswaterstaat. Filarski—already mentioned in the previous chapter, trained as an engineer and with a distinguished career at Rijkswaterstaat—was directly involved in the development of control rooms in the 1970s and 1980s and obtained a doctorate in history in the 1990s. After retiring, he devoted himself entirely to the history of transport. Almost everyone in my field knows who he is, especially within the Agency, but also within the inland navigation industry. His commissioned study is called (in translation) *Against the Current: Inland Navigation and Waterways from 1800 Onwards*, a 439-page full-colour book that seems to have the breadth and authority of a standard work. I spoke to skippers and operators who had bought it; once I even gave a copy to a couple of skippers as a thank you for letting me spend days on board without having met me beforehand. One retired operator described Filarski as "Rijkswaterstaat royalty".

Filarski devotes a section, less than a page, explicitly to inland navigation control rooms, including a picture of a control room from the 1980s with a detailed caption (2014: 313–4). He mentions Dordrecht as the first control room, the other fifteen control rooms remain anonymous and are collectively credited with "an important contribution to traffic safety" (313). I wrote to him, saying that I had read his book and had come across his name in archive material from the 1970s, and asked if he would like to take part in the oral history I was conducting. He replied that he was willing,

> although I warn you for oral history. After 35 years, every memory has gaps. Historiographical research shows that memories are sometimes based more on wishful thinking than on reality. Also in my case the surviving documents (so nice that they are still there!) are much more reliable than my memory. However, when you help me along with your knowledge of the factual material, I can perhaps tell you something about the background of those events. (Filarski 2017)

Filarski was not alone in emphasising the limitations of his memory—several others also mentioned this during the interviews and sent minor corrections and additions afterwards—but apart from Filarski, no one made it a methodological issue. No one except Filarski asked to read the quotations from the interview in this text so that he could approve them. I agreed to show them to him, mainly because I was curious to see what he wanted to change, but I did not promise to automatically adopt any of the changes he requested.

One significant difference between Filarski and all the others was that the history of the Dordrecht control room was only one episode in his career: as new projects arose, he changed positions. Then, after his retirement, he became an academic. This was in contrast to the operators who lived in the control room for decades, just as they had lived in the wheelhouses before. Where Zwijnenburg had handed over (parts of) his private archive, Filarski was able to tell me where to look in the State Archives and put me in touch with the historian at Rijkswaterstaat's Corporate Service, who promised to keep an eye out for any relevant documents they were digitising for their online database.

When I visited Filarski in his stately home, he wondered, even before I had started recording, whether my topic was interesting enough to warrant a dissertation (Field note 7.1.18). When I explained what I was doing, he seemed convinced. He does not reference the book of Goffe Halma, the former Rotterdam operator, although it appeared ten years before his book. When I interviewed him, I was also unaware of the existence of Halma's book, although I had been researching the subject for years. Halma's inconsistent handling of sources suggests that he was not trained as a historian, although the intention to work transparently is obvious. The typesetting and graphic design are also nowhere near as controlled as in Filarski's book.

Beforehand, I had thought of a task to give the interviewees: to draw an organisation chart of Rijkswaterstaat. This would serve two purposes. The first derived from observations in the field, where operators today feel quite lost in the Rijkswaterstaat organisation: it is large and has a complex structure, a legacy of its long history. In addition, their workplace is isolated from the offices where thousands of their colleagues work. So I wondered how they would portray the organisation and their position within it. Secondly, I knew from archive material that when the Dordrecht control room was built, the relevant departments were reorganised and

relocated, so I hoped they would familiarise me with past structures. No one felt confident enough to draw an organisation chart when asked, but Filarski asked for my notebook before I could ask him, and drew a chart to explain a reorganisation four decades ago.

So making sense of other times is done from the present and has to deal with a structured absence. This can be circumvented to some extent through private archives and oral history. Approaching historiography as a field means taking into account how actors have been historiographically active and reflects old dynamics between well-connected individuals and an isolated group. In addition, the tendency at Rijkswaterstaat is to look up rather than down, which makes it easy for those at the bottom to be overlooked. The aim here, however, is to include the bottom-up perspective and to write a history with the actors as much as about them. To this end, a number of actors read and commented on an article of mine in which I presented the main findings, which I was then able to incorporate into this chapter.

2.2. (Former) skippers with nautical media skills

It is important to know the biographies of the first generation of operators, as there was little training when they started working in the control room, meaning that they had to rely on skills acquired elsewhere (which brings previous work to the fore). Both the skills and the learning experience they brought to the control room explain how they shaped the operators' work. It turns out that the mediatisation of work, central to the development of control room work, was already happening on board their ships.

Joining and (never really) leaving a community of practice

Being part of the post-war 'baby boom' meant that Dirk Zwijnenburg (1945) sat in a crowded classroom in Rotterdam where he "learned little, nothing profound" (Interview 5.1.18). Later, at high school, he realised that he had missed the basics, and had to repeat a year twice before deciding, at fifteen, that he wanted to work. He had uncles who were sailors, "two of whom had drowned or something", so his parents were lukewarm about such a career choice (ibid.). So he started work in a margarine factory, but made sure he did not survive his probationary period:

> So that is when I started sailing on the Rhine, first on a tugboat as a deckhand, Rotterdam-Basel, there I climbed the ranks, until one day I was captain on a push boat, so I could sail with four barges lashed onto it. And there I left, until, yes, I did that till 1976. So I have been a captain for, say, seven years. (…) Already in 1961

> I sailed on ships with radar, as a sailor, and of course they let you take the helm, at night, and then you would master it, from the bottom up. (ibid.)

Learning on board is different. According to Lave, learning is "constituted in the experienced, lived world, through legitimate peripheral participation in ongoing social practice; the process of changing knowledgeable skills is subsumed in processes of changing identity in and through membership of a community of practitioners" (Lave 1991: 64). Radar was a novelty in inland navigation in the 1960s, allowing ships to sail around the clock. This provided many opportunities for young crew members to take over the helm—being in the wheelhouse would inevitably lead to such opportunities. Normally this would take time, but with push boats, one of the growing branches of shipping at the time, steep career paths were possible. "Newcomers become oldtimers through a social process of increasingly centripetal participation," writes Lave (1991: 68), and for Dirk Zwijnenburg, as for others, this centripetal movement happened quickly.

> Newcomers and old-timers depend on each other: newcomers to learn and oldtimers to carry on the community of practice. At the same time, the success of both new and old members depends on the eventual replacement of oldtimers by newcomers who become oldtimers themselves. (Lave 1991: 74)

The 'tensions' involved in this 'displacement' must have been eased by the expanding shipping industry—Lave's examples are much less affected by capitalist dynamics. Though things did not always move fast enough, at least not for Fokko Boersma (1956), another skipper-turned-operator whom I spoke to in his study in Zwijndrecht, on the opposite side of the Oude Maas from Dordrecht, with a direct view of the Dordrecht railway bridge.

He "came from an inland navigation family, both on my father's and mother's side" (Interview 4.1.18). When he was eight years old, he went to a boarding school for skippers' children—for decades these children had been exempted from compulsory schooling, staying on board and attending school whenever and wherever the ship docked (cf. Filarski 2014: 249–251). He later trained as a mechanic, but only worked as one for a few months.

> Then I went on board with my parents and sailed there for two months. My father and mother were actually somewhat passive entrepreneurs. They sailed on the skipper's exchange [a state-regulated market where skippers get their freight allocated, which was dismantled in the 1990s] and yes, that meant long waiting times and then a nice trip, but I soon had the idea that 'if you go into shipping, the ship has to sail, but it can't lie still, because then you don't make any money'. And so I went to Rhine shipping. I started as a sailor, but of course I already had a lot of knowledge, because you are born into this profession. (…) That was in 1973

> or so, 73, 74. I sailed first on freighters, as a sailor, on a few different ones, and afterwards I went into tanker shipping, because I just wanted everything, I wanted to gain experience. And um, then I went to work for a Swiss company, also first as a sailor, well, slash helmsman. I just had a lot of experience, I was able to do a lot and I was allowed to do a lot (...). I was twenty-one and had my Rhine patent up to Basel. (ibid.)

Being born into a community of practice gave Boersma a significant advantage, but he did not necessarily have the patience to wait for the old-timers once he felt competent. Shipping on the Rhine was considered the most prestigious: it had the biggest ships and the most respected skippers. Boersma told his Swiss employer: "I have my papers now, I want to grow now, I want to earn more and I want, I really want to become a captain" (ibid.). But "they replied: 'You can become a captain, but stay here for a while and develop yourself, and then when a place becomes available, you can take it.'" (ibid.) Boersma wanted to get ahead. His parents' ship was called Vios, short for 'vooruitgang is ons streven', 'progress is our ambition', which he adopted as a sort of personal motto (ibid.). Within two months, he left the Swiss shipping company to become captain on a tanker, aged 21.

One level up was owning your own ship. Dirk Zwijnenburg felt that in the local club for retired skippers he was somewhat looked down upon by the Rhine skippers who owned their own ship (Interview 5.1.18). When his father had to give up sailing due to deteriorating eyesight, Frans Heijlaerts and his wife ended up owning their own tugboat. When they retired, they moved back to live on the water. On board their self-renovated barge, moored in the old port of Woudrichem on the Waal, we spoke at the kitchen table in the ship's former hold, while his wife read on the couch within earshot.

> Asher Boersma: I usually start with a simple, sort of rough idea of your working life.
> Frans Heijlaerts: Yes.
> AB: Well um, um also because people have often also sailed before [they became operator], so that is relevant for um, for my insight into the occupational group, so to say.
> FH: Yes, yes, yes.
> AB: So um, yes, perhaps you can tell what your first job was and um, or maybe training, or um..
> FH: Well I was born on a steam tugboat.
> AB: Ah, when was that if I may ask?
> FH: Um 1952 and um, yeah, the first years of my life I was on board until I had to go to school, well, actually until my sister had to go to school. Then my mother went ashore and my father continued to sail and (...) yeah, so I had a life ashore.
> AB: Hmm, and where did you grow up?

FH: In Dordrecht. Well, yeah, as soon as I saw a chance I went on board, so I actually went on board all my holidays, school holidays, I worked [on board]. And um, so I got into the tugboat life. So I permanently sailed along since my eighteenth? Mieke Heijlaerts. H: Sixteenth.
AB: So that was 1968.
(Interview 19.2.18)

When asked about his first job or education, Heijlaerts says that he was born on a ship. He and his wife used to sail together. As discussed in the previous chapter, families began to live on board at the end of the 19th century in order to save on accommodation and personnel costs. Although Mieke Heijlaerts was present during the interview, I did not realise how much this was also her working life, and was too ignorant to ask how this changed for her once they sold the ship, their enterprise ended and Frans went to work for Rijkswaterstaat. Worse still, I did not even write her name in my notebook and had to ask by e-mail when I wrote this.

Ad van Zanten (1944) later became a control room supervisor, but also a skipper, although he had grown up on land. I spoke to him in his apartment in the old town of Dordrecht, overlooking the Oude Maas.

Asher Boersma: May I ask what kind of work your parents did?
Ad van Zanten: My father was the manager of a branch of Kruideboer (…), which was a men's fashion store. They had about twenty-five, at that time, twenty-five shops all over the country, one of them in Vlissingen [south-western coastal town on the Western Scheldt, important port]. (…) And my mother was a skipper's daughter.
AB: And what kind of shipping?
AvZ: Inland navigation. (…) I have a cousin who sailed at sea and the rest [of the family] nothing but inland navigation.
AB: So you grew up with people in your family who sailed.
AvZ: Yes. I, of course you don't remember yourself, I never said anything else when they asked me what I wanted to be when I grew up, other than 'I'm going to sail'.
(Interview 17.4.18)

He started sailing at the age of sixteen, but it took him a while to find an employer who would support his ambitions. Three years later, in 1963, he found a job where he could climb the career ladder. The shipping company Van Ommeren was a key player in the growing push boat industry (and the same company where Dirk Zwijnenburg worked). Van Zanten had to start at the bottom as a sailor, but by the age of twenty-five he had become skipper of a crew of fourteen, which in retrospect was "too early", as he had not yet combined his skills as a skipper with the authority of a captain (ibid.). He learnt a lot, "though I went through the school of hard knocks" (ibid.). (ibid.)

Jan Timmer (1961), the only operator not yet retired, also ended up working for another company specialising in push towage. When asked about his working life, he replied: "I am a skipper's son", an occupation that has been in the family for generations (Interview 20.2.18). Did this mean that he grew up on a ship?

> No, (…) my father and mother then lived on the shore, because my father is actually, um, my mom comes from an inland navigation tradition, but my father did (…) do sea shipping school. He had sailed with my mother and then the brother and sister who came before me went to boarding school. When I came, well, (…) my father then started at Nationale Nederlanden [insurance company], he went to shore from the coaster [a sea freighter sailing along the coast]. Then he became an inspector at Nationale Nederlanden, an insurance inspector. Then they offered him a house and a car in Spijkenisse [west of Rotterdam]. (…) And I went to the Rhine and Inland Navigation School in Rotterdam. And then sailing, first just on a single barge, a motor freighter, but then, um, then crossed over to push boat shipping. (Interview 20.2.18)

Timmer's parents had left the mobile shipping life behind before he arrived, although he still identifies as a skipper's son and has returned to it. He had made it to first mate on a push boat when he looked for a job that would allow him to be more at home, sailing one week and home the next. In 1983 he started working on a patrol boat for Rijkswaterstaat, where he had to start at the bottom again, as a sailor.

Only Van Zanten said he was done with shipping and wanted to move on; the others cited family reasons. Zwijnenburg switched in 1976, after the birth of his second child, and went to work on a lock for Rijkswaterstaat near Utrecht, as well as working shifts as a captain on a patrol boat, on a bridge and at the signal post overseeing the junction of the Lek and the Amsterdam-Rijnkanaal. Looking for work on land, he sought for something that "still had to do with shipping," but "it was very hard to find something." (Interview 5.1.18) Being a captain on a push boat paid well, and Rijkswaterstaat was suspicious of anyone willing to take such a big pay cut: "Here in Dordt [short for Dordrecht] I went to talk, tried to talk, didn't get past the receptionist. (…) And luckily in Utrecht I was able to convince the bosses that I really wanted to go ashore and that finances weren't an issue." (ibid.) Frans Heijlaerts started working in 1982 for Rijkswaterstaat, initially on a patrol vessel. They had sold their ship because they were suffering from an economic downturn and decided that they wanted to live on land as a family—by now they had children. "I was my own boss, of course, and I didn't have any papers and (…) in those days you had to start at the bottom," Heijlaerts explained (Interview 19.2.18). Fokko Boersma started on a lock when he moved to Rijkswaterstaat—his wife, who was "from land", demanded that he live on land, where they were looking for people with "practical insight" (Interview 4.1.18).

Although all skippers had to make financial sacrifices to become operators, none were as financially tied down as Heijlaerts. Owning a ship, as will be seen in chapter four, exposes skippers to market fluctuations, leading to a growing fleet in good times and overcapacity in downturns. The ability to sell a ship at a profit or with limited losses depends on when in these cycles the ship was built or bought and when in the cycle it was sold. Boersma, Zwijnenburg and Timmer were able to change employers far less dramatically.

Mediatisation

Van Zanten, Zwijnenburg, Timmer and Heijlaerts mentioned their experience with radar as a key competence for Rijkswaterstaat. Push towage was one of the few branches of inland navigation that was dominated by shipping companies rather than privately owned vessels. The pioneering work in the calibration (adaptation of a maritime technology to a different environment) and formalisation (establishment of formal training for crews) of radar for inland navigation was carried out to a large extent by these shipping companies. Meeting the needs of German industry for iron ore and coal was a round-the-clock business, requiring large crews to work in the engine room, on deck lashing barges on and off, and in the wheelhouse. Sailing at night was not possible without radar, but even in daylight, Van Zanten put the radar on an equal footing with the rudder and propeller (Interview 17.4.18). As we learned in the previous chapter, the limited manoeuvrability of push boats was also due to the lack of rudders up front, 160 metres (give or take) from the wheelhouse. This was most noticeable in bends, where they took up most of the space while drifting. As a result, the limited manoeuvrability required better situational awareness and therefore earlier detection of traffic. The view of the water from the wheelhouse was no longer sufficient, and the skipper's field of vision was widened through mediatisation.

Mediatisation is defined here as the process in which information pertaining to one's immediate surroundings is increasingly brought to the observer through mediation, in which this information is represented by electronically powered interfaces to the observer. In the process, media become embedded in the sensory perception of one's environment by translating and extending the human sensory capabilities. The result is a complex interplay between senses and media (cf. Willkomm 2014, 2022).

The prevailing understanding of mediatisation, or "mediatisierung" (Krotz 2017), emphasises communication (cf. Krotz and Hepp 2013), and is rather broad:

> Generally speaking, mediatization is a concept used to analyze critically the interrelation between changes in media and communications on the one hand, and changes in culture and society on the other. At this general level, mediati-

> zation has quantitative as well as qualitative dimensions. With regard to quantitative aspects, mediatization refers to the increasing temporal, spatial and social spread of mediated communication. Over time we have become more and more used to communicate via media in various contexts. With regard to qualitative aspects, mediatization refers to the specificity of certain media within sociocultural change: It matters what kind of media is used for what kind of communication. (Couldry and Hepp 2013: 197)

In another definition, it becomes clear how much ground it is meant to cover:

> Thus, mediatization is not only a process of upcoming new media and the coming into existence of an increasingly complex individual media environment. It is not only a process of 'more and more' media used in communicative action, but also and especially it is a metaprocess that consists of a changing everyday life, of changing identity constructions and social relations, of a changing economy, democracy and leisure, of a changing culture and society as a whole. (Krotz and Hepp 2013)

My understanding of mediatisation still addresses a significant change with media at its centre, but differs from the above in three ways. First, it captures a situated historical trend rather than a meta-process. Second, it focusses on the way in which we observe our environment and how media make us focus more on the interior, on the interfaces, if we want to understand what is around us outside. Third, this does not mean that our senses play no role in registering what is around us, while being in the wheelhouse or in the control room. It means that we learn to hear and see what is outside differently through the media. Yet, we also learn to verify what the screen tells us by looking outside, something operator Rolph emphasised about the location of the new control room in the introduction.

We will return to the practice of mediatisation later in this chapter. For now, it is important to know that, at least for Dutch inland navigation, it preceded the control room. And that it is no coincidence that a certain group of skippers who were about to become operators were no strangers to the process. We will now turn to the early days in the control room on Devil's Island and the working conditions the operators had to face.

2.3. Dordrecht control room (start-up) problems

Some of the difficulties of working on Devil's Island could be described as growing pains, but others, as we now know, persisted throughout. This is not to say that they were never addressed or experienced, but that they persisted or reappeared.

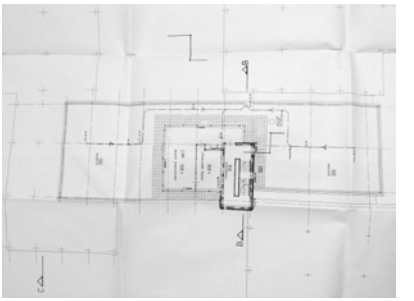
The planning and construction of the facilities is well documented in the National Archives. As an extension to this dossier, there are a number of documents relating to issues in 1981, when the building was complete but the radar coverage for the control room was not (which would be operational from 1982). They can be divided into 1) minor problems with the building that required minor adjustments, 2) infrastructural challenges such as intermittent mail delivery and parked vehicles blocking the entrance to the site, 3) staffing problems that persisted in one way or another.

Staffing the control room was a challenge from the start. DGSM resorted to hiring temporary staff, but was immediately informed by the union that this was against the collective agreement, and DGSM conceded this point (cf. Levenbach 1981). The collective agreement for Rijkswaterstaat staff also included a guaranteed number of Sundays off. This meant that the control room sometimes had to operate at reduced capacity and patrol boats did not go out. Internally, this was seen as embarrassing for Rijkswaterstaat's "image" (Eijk 1981). The organisation had long been sensitive to public perception and, as discussed in the previous chapter, it was not as favourable as it once was. This particular episode fits into the rivalry with the National Police over who was the main authority on the water, which lasted until Rijkswaterstaat gave up this ambition in the early 1990s (Interview 5.1.18).

During the outbreak of the operator-management conflict in 2015, the Dordrecht operators complained about the use of temporary workers to deal with staff shortages. The temps were not allowed to work on any of the consoles, except for one where they maintain the central freight database. Previously, this console had been used by operators to wind down in the rotation schedule of the busier day shifts, as this task was less intense and challenging. In addition, during the same outbreak, one of the two radar consoles was sometimes unmanned. Ships calling in went unanswered. This made headlines in shipping magazines and was embarrassing for the operators (Field note 8.6.15, Interview 29.4.16).

From these early days, one issue stands out as seeming to be a start-up problem, not directly related to control room work, but in fact becoming a nagging issue elementary to control room work. It concerns basic human needs: sociality, food and sanitation. The basic elements to provide these were not entirely in place when construction was completed. The inadequacy of the facilities highlighted and sometimes exacerbated the labour issues discussed above. This is not to say that everything went wrong from the start, but it is often the case that the everyday experience with a building depends on "inwiefern die architektonische Umgebung als widerständig erfahren wird" (Neubert 2018: 29).

Figure 5: Photograph of Dordrecht control room early 1980s, from Zwijnenburg's private archive. Figure 6: Plan of the upper floor of the same building, where the control room was located.



A kitchen and bathroom in the control room

The canteen smelled old, unused. We came down from the control room—this was the room where Jan Timmer was sure we could talk uninterrupted. When he brought me my tea, he saw how I took in the room. It was filled with tables and chairs for about 50 people, and in one corner there was a stainless steel counter from which food could be served. Once the canteen was closed, which happened quite recently, the social cohesion in the building was gone, Timmer noted. The two floors below the control room on Devil's Island, consisting of offices, laboratories and workshops, were largely abandoned when we sat down to reconstruct the history of work at the site in the winter of 2018. The operators had never been entirely dependent on the canteen for food or social interaction.

Rijkswaterstaat quickly realised that it had forgotten to install a stove in the small kitchen in the control room (Figure 6, cf. Stoppelenburg 1981). A small electric stove was installed. The canteen on the ground floor catered for people working normal hours, not 24-hour shifts, so meals were prepared or heated elsewhere.

Dirk Zwijnenburg, who started as an operator at DGSM in 1983, recalls that in the early years, a kitchen upstairs in the control room had its shortcomings. The control room staff consisted of a radar operator, like Dirk, and an operator who directed the patrol vessels by listening to the marine VHF radio frequency for a much larger area than there was radar coverage. The radar operator initially worked for DGSM and the other operator worked for Rijkswaterstaat. The latter was not qualified for radar work, but would take over when a radar operator had to use the bathroom, which was one floor down. Zwijnenburg recalls:

> When I went to work there, you actually had a console, right, and the kitchen and a table. Then in the mornings they had so little to do at [Rijks]waterstaat that the telephonists and the like came upstairs then and they would sit there,

> chattering, before they went to work, drinking coffee nice and cosy, you know, but there was someone from DGSM of course behind his console working very concentratedly, during fog or something. So, there were people who said: 'Well, we need a glass separation,' you know (chuckles), 'we want nothing to do with that jabber.' (Interview 5.1.18)

Apparently the smaller kitchen was preferred to the larger canteen for informal meetings. The room, famous for its exclusive and "colossal" (Nanz 2016) view, had an open-door policy, at least initially. Much later, tinted, reinforced doors controlled from the inside became the norm.

Whether it is a pantry (cf. Van Hulst 2013) or a canteen (cf. Fielding 1994), for police officers working the beat, as for detectives (cf. Reichertz 1992), these are crucial places to regroup. For Dutch police officers the

> space where team members had their coffee breaks, lunches, dinners, midnight snacks and celebrations was actually not a catered canteen. It is a space of 20 square meters (…), with a kitchen on one side and a big table with 12 chairs around it on the other. It was a place to talk about all aspects of police work and about more private and general matters, such as how one spent the weekend or a holiday, or even the national or local news. (Van Hulst 2013: 633)

For German detectives, hanging out in the *Teeküche* meant exchanging contingent knowledge while blurring the boundaries between work, breaks and private life (cf. Reichertz 1992: 143). The whole point of these places is that direct colleagues can drop in at any time to discuss work and everything else. The Dordrecht control room did not initially have such "protected sociability" (Wacquant 2004: 26). From my fieldwork I know that long after the "telephonists" stopped visiting the control room, the patrol boat crews continued to come. Not only are they much more sensitive to the work of the control room, but they also have work-related insights to share. Observing the outside world in the control room is done by staying inside, which meant that in the first installation in Dordrecht there was no (acoustic) space for people to enter. Thus, Rijkswaterstaat and DGSM did not seem to fully understand the requirements of control room work when they designated the control room kitchen for general use.

The comparison with various forms of police work is justified firstly by the fact that they also work shifts, secondly by the fact that they are representatives of the state, and thirdly by the banal fact that their stations are some of the most ethnographically recorded workplaces. Both Reichertz and Van Hulst write that these communities steer clear of the catered canteen for work-critical interactions. Jan Timmer seemed to suggest that the cohesion of the larger organisation was established in the canteen, during breaks. Dirk Zwijnenburg recalled that in the

early years they worked 12-hour shifts. The radar operators had little time to relax, as they were tied to the radar screen, which amounted to an "unbelievably high work pressure" (Interview 5.1.18)—leaving little time to socialise with the wider organisation, either in the canteen or when the organisation came to their kitchen.

For a number of years there was no kitchen, as the space was needed when the control room moved from two to three consoles in 1987. A cargo database called VMVS was introduced, maintained by a Rijkswaterstaat operator, to which tankers and ships of exceptional size reported via a separate marine VHF radio frequency (cf. Halma 2004: 283). Radar coverage was extended further west on the Oude Maas to include the Heerjansdam bend, which was notoriously difficult for seagoing vessels to navigate. During the day there were now three operators—one at the radar console coordinating traffic at the two Dordrecht crossings, one as contact person for all waterway users and one to monitor the dangerous bend and work on the database—while the night shift was carried out by two operators (Interview 5.1.18).

Figure 7: The upper half of a photocopied article that appeared in a trade journal. Above is a photograph of Zwijnenburg, below one of Van Zanten. The former had kept this copy, and corrected the marine VHF radio frequencies of the two radar sectors, above is my handwriting, indicating that I can keep this copy.

5 MAART 1996 Scheepvaartkrant PAGINA 31

Regionale Verkeers Centrale Dordrecht gemoderniseerd

Hun werkdruk is normaal al hoog, maar tijdelijk hebben de verkeersleiders van de Regionale VerkeersCentrale Dordrecht te maken met een extra hindernis. Vorig jaar zomer is namelijk begonnen met de verbouwing en uitbreiding van de verkeerspost op het Duivelseiland. Terwijl om hen heen gebroken en gebouwd werd, ging de verkeersbegeleiding op de drukst bevaren kruispunten van Nederland gewoon door. Met dank aan de speciaal daarvoor aangeschafte geluiddichte koptelefoons en ettelijke dozen oordoppen. Inmiddels is de ergste overlast achter de rug. 'Achteraf is het allemaal ontzettend meegevallen. De enige last die we nu nog hebben, is als één van de timmerlieden of technici de hoesemuziek op de radio hard zet,' zegt Ad van Zanten. Hij is Hoofd van de Regionale VerkeersCentrale in Dordrecht.

De bouwwerkzaamheden aan de Regionale VerkeersCentrale Dordrecht vorderen snel. Er wordt al druk gewerkt aan de inrichting van de verkeerstoren. De eerste consoles staan er, maar ze zijn nog niet aangesloten. Toch werkt één van de nieuwe radarsystemen al. Daarop krijgen de verkeersleiders hun tweedaagse cursus om te leren omgaan met de nieuwe apparatuur.

Het VTS-systeem (*Vessel Traffic Service*) wordt geleverd door Holland Institute for Traffic Technology (HITT) uit Apeldoorn, een verzelfstandigd onderdeel van het voormalige Holland Signaal. Er wordt gebruik gemaakt van de door HITT onder de naam Aramis ontwikkelde beeldschermpresentatie *de de* Terma-ra-

len (sector Dordrecht) en 18 (sector Heerjansdam).

'Vroeger wisten veel schippers niet waar wij zaten,' herinnert Van Zanten zich. 'Dan dachten ze dat de telpost van de Dienst Verkeerskunde die vroeger bij het Slobbengors stond, de verkeerspost was. Of het tunnelgebouw van de Drechttunnel.'

Anderzijds hebben de verkeersleiders straks ook een beter zicht op de vaarweg. 'Voor het gevoel blijft het zicht op een stuk van de rivier belangrijk,' weet Van Zanten. 'Je zou een VTS-centrum ook op de Mookerheide kunnen bouwen en alle posten, Dordrecht, Wenjeldingen, Volkerak, noem maar om, daar bij elkaar zetten. Technisch is het geen enkel probleem, maar in de praktijk werkt dat niet.

Niet alleen het ruimtegerelk noopte

• Verkeersleider Dirk Zwijnenburg, met op de achtergrond de nieuwe contouren van de verkeerspost. (foto's MGR)

wijzingen geven - vroeger noemden we dat nog bevelen. We gaan ervan uit dat de schipper zelf heel goed weet wat wel en niet kan tijdens de vaart. Hij is ook te allen tijde verantwoordelijk.

Maar als blijkt dat men elkaar niet verstaat, of elkaar niet wil verstaan, of als er een vergissing plaatsvindt, mogen wij een verkeersaanwijzing geven.' De bewuste vaarweggebruiker is verplicht die aanwijzing op te volgen.

'Vaart iemand in dichte mist aan de verkeerde wal, dan wijzen wij hem erop dat hij stuurboordwaarts moet [illegible]. Daar hij dat niet [illegible]

bij een overtreding. Afhankelijk van

5.1.18). This meant that a fourth operator was required. It was not until 1996 that there was a toilet and a decent kitchen on the control room floor again. By then, construction work was completed, which made the control room at least twice as large. It had five consoles, with one added as a backup and for training. In an interview with the specialist magazine De Scheepsvaartkrant in 1996, control room manager Van Zanten and operator Zwijnenburg explained the changes in detail (cf. MGR 1996). The latter kept a copy and gave it to me (Figure 7). With a solution in sight—the renovation of the control room was not quite complete when the article appeared—both are quite frank about the situation the operators were in: working there with four operators in just 50 square metres was against Dutch labour law (ibid.). The new control room also addressed the disregard for ergonomics until then, Van Zanten conceded implicitly in the article, when discussing the inadequacy of the radar devices. From 1982 to 1996, the operators worked with the same British Decca radars built for ships, which gave a very rudimentary picture (more on these radars in a moment). In addition, operators had to deal with significant gaps in their radar coverage. In our conversation, he said that ergonomic improvement had been his top priority ever since he got involved in planning the control room renovation (Interview 17.4.18).

Having sketched out the working conditions of the early years, the question remains as to what explains them. It could be said that what applies to architecture also applies to the Dordrecht control room: "social relations and meanings materialised in (…) built surroundings" (Stender 2017: 31). What exactly had materialised here, and how did certain relations continue to materialise in certain ways?

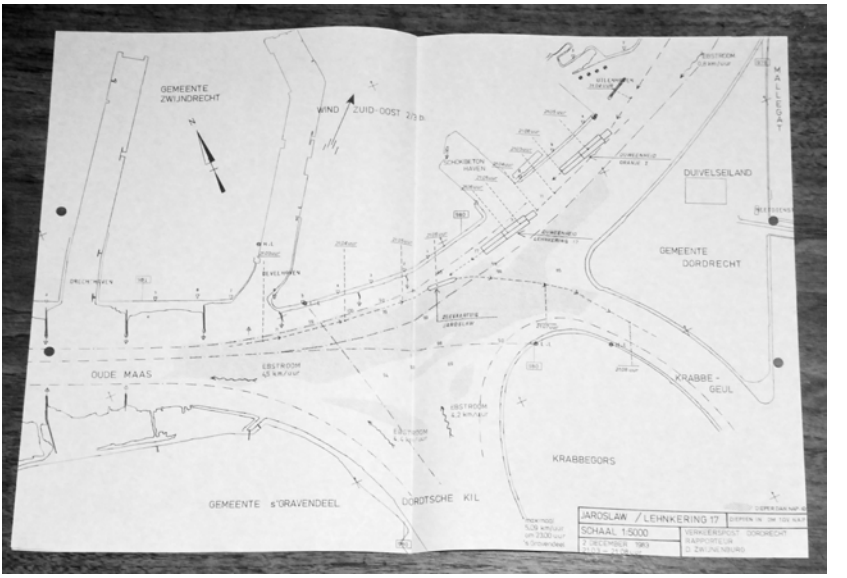
While it cannot be ruled out that similar persistent symptoms may have different causes, most of the explanations discussed in this chapter are long-term processes. A form of ignorance within the Rijkswaterstaat organisation about what their ambition to have a hand in waterway traffic round the clock would entail is only a valid explanation for so long. The question also arises as to what the operators did to give shape to the work under these physical and organisational conditions. In other words, what constrained them and what enabled them to influence the way in which the work was defined and could be carried out?

2.4. A first professional rivalry

These are big questions that require several steps to answer. One such step is to understand how the authority and legitimacy of operators was linked to other actors with similar ambitions. We have partly discussed how control rooms as such are part of organisational legitimacy and authority, but not yet what this looks like in terms of the work itself. Here, the relationship between pilots on ships and control room operators is presented from both a practical and professional perspective.

Despite the overwhelming visuality of the control room, listening is a key part of the job, as communication between the control room and the ships is by marine VHF radio. When entering a sector, skippers tune in to their frequency and inform the control room of their intentions. From my fieldwork both on ships and in control rooms, it is clear that skippers and operators are talking very differently these days. Operators are trained in what is known as conversation discipline. The capacity of VHF radio is such that it is impossible to send and receive at the same time. When many vessels are involved, passing arrangements must be communicated quickly so that the frequency is open for 1) alternative proposals, or 2) confirmation of arrangements by all involved, and then 3) a new wave of traffic can come in. Skippers tend to be more chatty and informal than operators, often requiring more words. Given the current contrast between the use of VHF radio between operators and skippers, I assumed that records of communications between operators and skippers, their former colleagues, in more informal times could be highly valuable historical sources. In the official archives I found no records of anything that looked like daily control room work, and therefore no transcripts of operator-skipper communications.

Figure 8: Map of the 1983 incident as documented by Zwijnenburg, showing Devil's Island in the upper right corner, left of which two pusher boats are drawn, and the Jaroslaw and its course into the Krabbegeul are drawn. The wobbly arrows represent the riptide, the wind direction and speed are also indicated.



Fortunately, Dirk Zwijnenburg's private archive contained a report on an incident in 1983, which included a transcript of a conversation between the control room and the *Jaroslaw*, a seagoing vessel (cf. Zwijnenburg and Zanten 1983). Because of its size, the *Jaroslaw* was obliged to take a pilot on board before entering a port or, as in this case, venturing further inland up the river. A pilot advises the captain on all matters of navigation and communicates with the local authorities. What was transcribed was a heated interaction between a Dutch pilot and Zwijnenburg. The pilot had asked to use the middle of the fairway to turn the corner and enter the Krabbegeul—at the junction of the Dordtsche Kil, the Oude Maas and the Krabbegeul, the currents and riptides (which vary at the confluences) are considerable—and was finally granted permission. Afterwards, Zwijnenburg carefully plotted the ship's movements on a paper map, using radar data, so that the spatial aspect of the manoeuvre can still be understood today (Figure 8). By the time the *Jaroslaw* had reached the port side, it was on course for a collision with two barges travelling downstream in the opposite direction and keeping to starboard (as is the rule). Zwijnenburg tried to persuade the pilot to change course. While seagoing vessels, due to their size and draught, have the right of way as they are tied to the shipping lane, inland vessels can often pass a buoy on the wrong side, but not in this case. The two pushers each had four barges tied in front of them, making them 180 metres long, more than twice the length of the ocean-going vessel. In order to avoid a collision, both had to put their ships into reverse, as ships cannot brake, and as they travelled downstream, stopping would take forever. Zwijnenburg's intervention would have had consequences for the pilot's liability if things had actually gone wrong—if Zwijnenburg had done nothing and things had gone wrong, he would probably have been accused of negligence. At that time, the pilot and the operator still had the same employer, the DGSM, which meant that its formal report for reckless navigation ensured a reprimand for the pilot (Interview 5.1.18). What I had encountered here was not so much an example of the everyday interaction between operator and skipper, but a manifestation of the rivalry between operator and pilot, which was recorded because of the escalation.

Retired operator Halma (2004), in the self-published book mentioned above, describes how pilots had difficulty recognising the authority of the control rooms. This illustrates how professions function in a system, as Andrew Abbott understood it, a system in which "jurisdiction is the defining relation in professional life" (Abbott 1988: 3). This is because "[p]rofessions develop when jurisdictions become vacant, which may happen because they are newly created or because an earlier tenant has left them altogether or lost its firm grip on them" (ibid.). The rivalry took place mainly in the ports, where the pilots had a monopoly on navigation as a service, but occasionally spilled over into Dordrecht's territory. Dirk Zwijnenburg explained that the incident illustrated the inferior position that inland navigation skippers held, who

were always expected to accommodate sea traffic, never the other way around (Interview 5.1.18).

In everyday life, being a professional has become synonymous with competence and authority, and being paid for one's work is generally enough to claim the label. From a sociological point of view, however, a profession is a particular social arrangement of expertise. Expertise is controlled and curated by a group whose exclusive right to perform the work is granted by law. It enables one to work autonomously, with authority and within the safe space of a shared set of values, excluding rivals. This makes clients dependent solely on the expertise of one group, which is generally a relatively secure way of earning a comfortable income. Admission depends on qualifications: completion of formal education, often an apprenticeship, and both are traditionally extensive, as in medicine for example (cf. Susskind and Susskind 2015: 16). Shared values bind the profession, often including the aspiration to work in service of the public (ibid.: 17–18). A profession is "seen as an autonomous 'bastion,' which entails certain risks [liability for instance,] but also offers advantages." (Noordegraaf and Schinkel 2011: 100) The public plays an important role in this system. It is referred to as the "grand bargain" (Susskind and Susskind 2015: 21) or the "regulatory bargain" (Noordegraaf and Schinkel 2011: 100), which can also be understood as a social contract between the public and the profession, in which exclusivity is granted in return for "affordable, accessible, up-to-date, reassuring and reliable services" based on "expertise, experience and judgement" (Susskind and Susskind 2015: 22–23). In 2015, operators sounded the alarm that cuts had left control rooms dangerously understaffed. This could be seen as a desperate attempt to hold up their end of the bargain.

Professionalisation has long been a public notion and to attain the status of profession has been a goal (often never attained) for occupational groups. Harold Wilenksy, the author of one of the most cited texts on professionalisation, written in 1964 and called "The Professionalization of Everyone?", was asked to look back on the article in 1980. He wrote: "I was astonished by the number of professional association leaders who read it and asked me to solve their problem of achieving professional status – an invitation I have resisted" (Wilensky 1980: 9). In the sociological literature, classic "pure" professions such as doctors, lawyers and professors are often seen as distinct from "new" professions (Noordegraaf and Schinkel 2011: 102), although in practice they are often "hybrid" (Noordegraaf 2007). The point is that they use professionalisation strategies to gain recognition and autonomy. Operators knew that there was a difference between seeing themselves as professionals and receiving public recognition for it (cf. Halma 2004: 59).

A classic step towards professionalisation is to form an association. In 1975 the operators of Rotterdam and other maritime traffic control centres formed a 'guild' called Racon (Halma 2004: 49–65). Until 1990, Racon worked closely with a trade union and at times sounded like one. Over the years, the guild focused on four goals:

improving working conditions, standardising nautical communications, establishing centralised training, and gaining internal and public recognition for the profession. Many Dordrecht operators joined the guild, which lobbied for early retirement in recognition of the intensity of the work. Racon knew that nautical operator work was still in its "infancy" compared to piloting, which "since Roman times has been a recognised occupation." (Halma 2004: 60)

Compared to the operators in inland navigation control rooms, the operators in port control rooms, who actually founded Racon, struggled with a reverse problem: their knowledgeable skill was rooted in their navy days and was deeply connected to and afforded by their nautical media. The pilots on board of the sea vessels in the port structurally questioned their legitimacy. When in 1987 a Racon report was criticised in a maritime trade journal for operators' dependency on "advanced equipment" instead of "more severe training and experience" like the pilots, these former navy men were the ones targeted. Racon countered that this type of criticism lacked an acceptance of "normal developments in this modern technological world" in the interest of "HUMANS, ENVIRONMENT [sic] and above all Economy" (Halma 2004: 60–61). To qualify as a pilot, one must first climb the maritime ranks to become a captain on a seagoing vessel, directly responsible for and knowledgeable about the way a ship moves, much as the skippers-turned-operators had done.

The transcript of the 1983 dispute between a pilot and the Dordrecht control room ends with a conversation on a separate frequency, to leave open the frequency used for traffic coordination. Here Ad van Zanten, the most senior operator present, has taken over and is talking to the pilot on board the *Jaroslaw*, who had forced two larger push boats to make an emergency stop:

> Van Zanten: To me it appears richly overdone to have ships of over 200 meters go in reverse, because you with your 4-meter draft can't in an orderly fashion enter [the Dordrecht port]
> Pilot: You have no idea how this ship steers! You know nothing about the draft dimensions of this ship! You know nothing about this ship!
> Van Zanten: No, sir. We know that. You only know that. But I am telling you, we have made a video recording of it [...]. That is clear enough.
> Pilot: But you are judging things of which you have no knowledge (Zwijnenburg and Zanten 1983: 5–6).

The authority of the operator as a professional, and thus the authority of the control room, depends on the exclusivity of the operator's knowledge and thus on the client's dependence on this knowledge. Here, the pilot has his own knowledge and therefore thinks he does not need to listen, or at least that he can judge the information given by Dirk Zwijnenburg on its merits.

In his book, Halma has included a report that Heijlaerts wrote when, more than a decade later, he accompanied a pilot on a ship coming in from the sea towards Dordrecht (cf. Halma 2004: 286–289). He was amazed at how the pilot could embody the dimensions of the ship, which he had not known before. Heijlaerts was also impressed by the coordination with several crew members to make the navigation possible. In this sense, the argument described above was also about the ability of Zwijnenburg and Van Zanten to embody the navigational dimensions of the push boats approaching the *Jaroslaw*, while the latter was foreign to them.

2.5. Formalisation of work

The major change and challenge for the skippers-turned-operators was the formalisation of work, which took place in four interrelated stages: 1) the regulation of inland navigation and the formulation of control room tasks, 2) the formalisation of knowledge, 3) the relocation of teaching, and 4) the mediatisation of work. The first is the very basis, the mandate of the control rooms; the second and third are closely related: knowledge that was spread orally now ended up in textbooks, but another sense of relocation here concerns skill. At first, it was primarily available to the newcomer through mimesis, by working alongside someone who had put it into practice. Then a control room simulator was developed that took the transfer of knowledge and the training of skills outside the confines of the control room. This, in turn, became intertwined with the mediatisation of work, making the co-presence with the waterway and the observational skills that come with shipping experience less important as the interface became more important. All of this occurs in cycles, so that stages occur more than once, in more than one direction: new laws have led to further formalisation of knowledge, but initiatives to further mediatise work needed regulatory backing and also solidified the relocation of teaching.

Initial formalisation left room for operators

The formalisation of control room work depended on the formalisation of shipping, which for a long time followed convention rather than law. The first formalisation measures left operators with a degree of freedom with which they felt comfortable.

It is worth noting that the regulation of inland waterways took place at international level before national regulation. The Central Commission for the Navigation of the Rhine (CCR) had been in existence since 1815, and the Treaty of Mainz (1831) required skippers to obtain a patent for each section of the river, which could be obtained through proven navigation experience. Other Dutch waterways were not regulated until 1897, and ambiguities were not removed until 1965 (cf. Filarski 2014:

310). It was not until 1984 that a new regulatory code formalised the use of traffic signs (ibid.: 310).

As reported in the previous chapter, in 1979 a communiqué from the agency informed shipping that the "post is at the service of shipping on the waterways around Dordrecht" (Hoofdingenieur-Direkteur 1979). It would concern itself – not yet around the clock and without radar – with the compliance with shipping regulations and act as a "control post from where, in order to enhance safety, shipping will be assisted with information and advice, possibly with sailing instructions" (ibid.). A 1983 report by Ad van Zanten defines the work: "[w]ith help of radar […] and TV […] traffic information is supplied to the waterway user and permanent surveillance of the traffic development takes place within the coverage area" (Zanten 1983: 1). The goals are "guarding and accommodating a swift and safe traffic development, in cooperation with the patrol boat" and "to contribute to preventing shipping accidents and reducing the harmful consequences for passengers and ships" (ibid.). The tasks are categorised and defined, but in such a way as to leave room for them to be carried out in different ways.

Dirk Zwijnenburg recalled the informal days: "when you knew a period of high water was coming due to rain or meltwater, the local wool shop was warned that they had to clear their basement, farmers were warned to move their cattle" from riparian land (Interview 5.1.18). Fokko Boersma insisted that the operators were not inclined to interfere with other people's work (Interview 4.1.18). They appreciated being left alone—management rarely set foot in the control room—and operators still do not like to tell a skipper what to do. Although they had the authority to intervene, they were reluctant to do so when professional skippers were involved. They could resort to giving an order called a "traffic instruction". There are operators who have never given a traffic instruction in their entire career, others have given one or two, and they are proud of it, because a skilled operator should be able to get skippers to do what they want, while the skippers think it was their own idea (cf. Interviews 4.1.18 and 5.1.18; Field note 14.11.16; Field note 3.4.17; Halma 2004: 25).

Loose learning on board in a formal structure

Reading Marcus Popplow on the role of formalisation in technology-related knowledge in early modern Europe (2015), it occurred to me that in my field the formalisation of work had already occurred before formal education and the disembodiment of knowledge. Before the sedimentation of formal training—which guarantees the spatial and temporal separation of work, teaching and learning—the skippers who became operators were already shaped by formal arrangements. Apart from the occasional course they attended, most notably one to obtain a radar certificate, their (work) biographies show how the formal arrangement of actual work on board formed a curriculum in itself. Before they could become skippers, they passed

through at least three different positions on board, each of which had to be mastered before progression to the next job was possible—mastery being determined by the length of time the job had been performed and by the approval of colleagues who had progressed further in the system. The history of the formalisation of control room work thus has its roots in the inland navigation practices of the 1960s and 1970s in the Netherlands, but often the learning started even earlier, as many of the skippers-turned-operators were born into a community of practice.

During a four-day voyage on a 135-metre barge through German, Dutch and Belgian waters, I was able to observe and participate in a slice of learning as an ongoing loose practice. The ship was owned by Rebecca and Rob, a couple in their late fifties/early sixties, with the husband spending most of the time at the helm. They employed a Czech sailor called Leo, with whom they spoke German.

> Leo […] is now at the helm, 'eben festhalten', Rob had said and instructed him about the course. Leo doesn't sit down, stands behind the skipper's chair, doesn't have to change speed, just hold course. After a few minutes Rob is back (Field note 27.11.16 to 30.11.16).

Rebecca is also qualified as a skipper and spent time at the helm too. When she had to go to the toilet and Rob was asleep, she asked me to take over. The first time I had very little to do. The second time was different:

> We were on the Hollandsch Diep [a wide waterway in the south-west of the Netherlands] when Rebecca asked me to take the helm again. This time, I really had to steer, but had less clear instructions and now it was dark. Got a better sense of the helm by trying and seeing how the ship reacted. She invited me to sit this time, but felt more comfortable standing like Leo did. (Field note 27.11.16 till 30.11.16)

Learning comes with being on board and starts before anyone declares the lesson to have begun, or with the idea of teaching at all. Before holding the helm—an almost horizontal steel stick of about ten centimetres long with a black synthetic knob at the end—I already developed a sense of its kinetic and tactile dimensions through observation, which I only realised once I was using it. But there are also formalised elements: I saw that the captain's seat was off-limits to Leo, which would surely be the case for me. This would have been a normal situation for those born into the shipping community of practice, as both Rob and Rebecca were.

The first to leave the ships were the children. Skippers' children were exempted from compulsory schooling until 1966—after the war, specialised boarding schools were set up. From the 1980s, it was mainly mothers who made long cross-border journeys at weekends to pick up their children. Now most parents have followed

their children, and the floating houses have been replaced by brick ones. Boarding schools are being closed. Skippers work in shifts, about a week on board and a week off. It has become increasingly unlikely for skippers' children to share the wheelhouse (long enough) for them to master the work through mimesis. Shipping is still primarily learned by starting out as a sailor, with occasional time at the helm. At present, there is a shortage of inland navigation personnel—no wonder, as there is no one else in the wheelhouse except the skipper.

As several of the first generation of operators confirm, their experience with both radar and marine VHF radio was sought after by Rijkswaterstaat and DGSM. The advantage they had over naval radar operators looking for a job on land was their knowledge of the waterways and their lived experience with the much narrower spatial margins typical of inland navigation. All this they had learnt at the helm (cf. Halma 2004: 279).

Early media technology affords autonomy

Many skippers-turned-operators encountered their first computer in the control room. In 1984, perhaps 1985, the first one was introduced, called Birgitte by the operators, which "nobody knew how to use", according to Fokko Boersma (Interview 4.1.18). Frans Heijlaerts thought that it was mainly the 'old school' that had problems with it. Around 1982, he had bought a Commodore 64, when he and his family moved to shore, and had programmed games with it (Interview 19.2.18). He recalled that in his first report, which was written on a computer rather than a typewriter, one operator actually "proudly" mentioned in the report what medium it was written on (ibid.). There was also resistance to the introduction of computers—eventually not only new operators but also experienced ones had to take a course to learn how to write their shift reports on the computer (ibid.). A document written by Van Zanten shows that standards were eventually developed to bring uniformity to these reports (1989). With this computer, they began to store their knowledge of various aspects of the waterway infrastructure externally, each shipping company, quay or jetty was given an entry, and the heights of bridges were documented (Interview Zwijnenburg 5.1.18).

The leeway that could be interpreted as professional autonomy in the control room work was also an affordance of the media they worked with. The logs made on Birgitte could be corrected later, when an operator discovered his mistake, without anyone ever noticing (Interview 5.1.18). Radar was not yet recorded automatically; recording was started manually when a dangerous situation seemed to arise, as in the case of the altercation with the pilot mentioned above.

Initially, the operators worked with the same type of radar as on board. In contrast to the development of many other media, the first radar was mobile (cf. Bauer 2005) and later became stationary. The Decca radars were located one floor

below, with cameras above them connected to screens in consoles in the control room above. One of these machines now stands in the corridor of the control room in Dordrecht. I passed it many times before I saw how the layout of the Dordrecht intersection was burned into the screen as a testimony to its not entirely afforded immobile use. These radars did not yet have concentric circles to indicate distance and were so rudimentary that "you were looking at nothing but dots, the actual picture you made in your head", as Zwijnenburg recalls (Interview 5.1.18). This embodied practice clearly positioned the operators within the agency as masters of traffic coordination, but the difference with Lave's model is that newcomers could not acquire the operator identity through training alone, as this had to be partly acquired beforehand while sailing. Furthermore, the limited view provided by radar meant that the exclusivity of their knowledge derived from their time at sea, as 1) local knowledge of the waterways had to compensate for the abstraction, and 2) scoping the waterscape as they had done in the wheelhouse—recognising vessel type, draught and manoeuvre—complemented what they had already assessed from the given traffic situation using radar and marine VHF radio.

Simulatable

From the outset, Racon had advocated centralised training in order to 1) reduce dependency on the local control room manager to control training and examinations, 2) raise the status of the profession by introducing official qualifications, 3) increase the competence of the workforce by introducing foreign languages into the curriculum, 4) standardise and discipline VHF communication (cf. Halma 2004, 49). The first part of the training was indeed soon centralised, which was an important step in the relocation of learning. To this day, the second part of the training is still carried out locally.

Inland navigation skippers are considered stubborn, but when it gets foggy, operators often explain, everyone suddenly becomes very obedient. On board well-equipped vessels, I have seen the nervousness that dense fog causes. As fog cannot be ordered, operators trained in the control room had to wait for this most critical weather condition to occur (cf. Halma 2004: 77). "Newcomers become old-timers through a social process of increasingly centripetal participation," says Lave, "which depends on legitimate access to ongoing community practice" (Lave 1991: 68). However, compared to a girl born as the daughter or granddaughter of a Yucatec Mayan midwife, a case quoted by Lave (ibid.: 70), or compared to someone born on a ship, operators have little time to master their work. One way to manipulate the events that contribute to centripetal participation, a way to manipulate what is going on, is the Vessel Traffic Services Simulator that the agency has built.

The first ideas for the VTS simulator date back to 1975, the contract with the Dutch developer Marin was signed in 1983, and by 1986 it was ready (reportedly the

first in the world) and inaugurated by Neelie Kroes, the Minister of Transport, Public Works and Water Management. It had cost a small fortune (cf. Halma 2004: 88–90). The simulator seemed to be modelled on the control rooms of the port of Rotterdam. No wonder, since the operators involved were mainly people with a naval background who had worked in maritime control rooms. They had co-developed the simulator, managed the training programme, written the training scenarios and set the learning objectives (cf. ibid.: 89–91; Interview 20.7.18; Interview 21.7.18).

In the simulator, old-timers and newcomers sat in separate rooms behind a console, each with a radar screen, a monitor connected to a shipping database, and a radio link between them. The simulation consisted of what can best be described as contingent events played out on a stable map (cf. Gekker and Hind 2016) of a port and its environs, with a river and a tributary—a situation that mostly resembled the layout of Rotterdam. A scenario, or 'run' as it is still called (Field note 23.3.17), would last about thirty minutes, with ships moving on the radar screen, the old-timer impersonating all the different ships calling in, or the newcomers calling in ships that they could identify by touching them with the pen on the radar screen, which then made their names, dimensions and cargo appear on the second screen. There were enough consoles to run four simulations simultaneously—each on its own or all together in one, each controlling its own sector and also communicating between sectors (cf. Halma 2004, 89–91; Interview 4.1.18; Interview 21.7.18).

Jan Timmer remembers the simulator as an experience "indistinguishable from reality", also because the old-timers were so good at impersonating different skippers ("a fisherman or an Eastern European skipper in broken German") (Interview 21.7.18). He had been a skipper on a push boat before moving to an agency patrol boat. His transfer to the control room in 1987 coincided with the start of simulator training. It is difficult to say where Timmer's legitimate peripheral participation began; from his patrol vessel, his participation was mediated by VHF radio, and his visits to the control room were certainly legitimised. However, there is a stark contrast between his assessment of the simulator and that of Dirk Zwijnenburg, who had already become a Dordrecht old-timer through his presence in the control room.

Looking back, Timmer felt that Rotterdam had always set the bar higher and considered them the benchmark. Zwijnenburg felt that the simulator—the type of radar, the training scenarios and the standards—deviated too much from the standard they had established locally in Dordrecht. Because they "took inland vessels just as seriously" (Interview 20.2.17). The use of the VHF frequency in Dordrecht was more intensive, which meant that the way the Rotterdam operators understood conversation discipline was not precise enough for the amount of calls the Dordrecht operators made in roughly the same time frame (ibid.). The translation of the dominant sociomaterial assemblage of the control room into centralised training made it, for some Dordrecht old-timers, a dislocation of teaching, but it was also a reloca-

tion of learning: the simulation enabled a kind of legitimate peripheral participation in the Rotterdam control rooms.

In the simulator, the fog became permanent, as the direct view of the water landscape disappeared. The weather conditions became what the scenario said they would be. The old-timers now acted out the nervous skipper. Newcomers learned to rely on their interfaces, the window pane no longer part of their scope of observation from the outset, as it had been for the first skippers-turned-operators. With the help of a research report from a consultancy firm, the Dordrecht operators succeeded in adding a stable map of one of the Dordrecht sectors to the simulation (cf. Verschoor and Giessen 1990; Interview 23.7.18). However, the fictitious Rotterdam-inspired map remained dominant. When I followed a cohort of newcomers in 2017 during their central training, all the runs I witnessed were made in the fictive port (simulating the typical traffic of such an area), even by those training for inland waterway intersections, which have distinct traffic patterns.

The continued mediatisation moved the action towards ever larger and more numerous screens, and subsequently made control room work increasingly simulatable. Over the years, the control room has been equipped with 1) AIS (name, GPS position, departure and destination of a ship are exchanged via radio signals) overlaid with radar on the digital chart, 2) Automatic Radar Plotting Aid (ARPA) was added as a function in this overlaid interface (with which potential collisions, but also time and distance between the current ship position and e.g. an intersection can be plotted), 3) more accurate gauges (such as wind speed, current, visibility, water level), increased resolution and light sensitivity of CCTV cameras, 4) internationally linked databases with detailed cargo information, and 5) ergonomic gains in the screens and consoles that bring all these interfaces together.

These developments allowed control rooms to 1) cover more ground, 2) without having to build new control rooms, and even 3) to centralise control rooms. Rijkswaterstaat's network of AIS transponders filled the black holes between control rooms. Until then, skippers had been geographically lost between the sectors covered by several control rooms. They could still contact the nearest control room, which could send out a patrol vessel and check the database to see what kind of cargo they were carrying, but otherwise they had to work things out among themselves. Ruud Filarski told me that the Tiel control room, built in 1984, was so expensive that it was impossible to build new control rooms (Interview 7.1.18). It had been designated as critical infrastructure, which in Cold War times meant that it had to be built of thick reinforced concrete, which Filarski found rather ridiculous (ibid.). So building new control rooms was not really an option, not financially, but eventually mediatisation allowed for expansions of existing control rooms that made building new ones unnecessary. Today, all three control centres along the Dutch-German waterway axis—Nijmegen, Tiel and Dordrecht—cover more intersections than are optically visible from the control centre.

The Port of Rotterdam, which is a separate organisation from Rijkswaterstaat, has centralised its control rooms much more radically. The Botlek control room combines six sectors. During the day I spent there, no one complained about this, including the Rotterdam operators I met during the simulator training (Field note 17.3.17).

2.6. Managers contesting professionalisation of operators

The operators' quest for professional status was to a large extent a matter of intra-organisational rivalry, due to Rijkswaterstaat's extensive role in the waterway infrastructure. The introduction of the operators had relegated the river masters to a subordinate position, although I found little to suggest that this was accompanied by much discord, possibly because of the operator-centred perspective I had within Rijkswaterstaat. Operators and pilots both worked at DGSM. When piloting as a service was privatised at the end of the 1980s, all the operators came to work for Rijkswaterstaat. Here they had to deal with managers: a group that stubbornly resisted anything that looked like the professionalisation of operators, partly as a strategy for their own professionalisation. They too were interested in formalising the work of operators, but on their own terms.

To understand this dynamic, we first look at the place of operators in the organisation of Rijkswaterstaat and the larger managerial trend from the 1980s onwards. We then look at the managerialisation movements from three angles: 1) the move from the control room to a managerial position, 2) how engineers in managerial positions within Rijkswaterstaat had to become managers, and 3) how the formalisation of operator work was managerialised and how mediatisation was used to serve managerial interests. This subchapter benefits from Mirko Noordegraaf's work on management in the Dutch public sector (2007) and the articles he subsequently wrote with Willem Schinkel (2011; 2011). They combine a much better command of the sociological debates on professions from a specifically Dutch perspective.

The managerial trend

Filarski wrote that "in the mid-1980s the state apparatus began to shrink, and this continues to this day" (Filarski 2014: 332). Whether this ambition has actually led to a reduction in the net number of civil servants is doubtful, as bureaucracies in Western Europe have survived largely untamed despite (or even because of) numerous efforts to achieve the opposite (see Graeber 2015a). While "post-bureaucracy" was the goal, it led to a "neo-bureaucratic state" (Farrell and Morris 2003). Perhaps Filarski is more describing a historical ambition that he, as the manager of Rijkswaterstaat, was called upon to help realise.

If the question was 'how to maintain the service with fewer staff', the answer was mainly felt by those with little education at the bottom of the hierarchy. The uniforms of the operators changed in meaning as a result of these changes. It once placed them at the higher levels of the Outdoor Division hierarchy. Fokko Boersma recalled that when he first entered the control room in the early 1980s, "all that gold leaf really made an impression", referring to the operators' shoulder straps (Interview 4.1.18). At that time, the department still included repair and maintenance crews, which also had their own hierarchical layers. The near disappearance of the layers below the operators was a significant change, Dirk Zwijnenburg felt (Interview 5.1.18). When in 2016 I asked an operator what the gold stripes on his shoulders indicated, he explained them and added that "when you have enough stripes you can take off your uniform" (Field note 4.11.16). Referring to a senior policy adviser, the same operator said: "You can see he's high up the ladder because he dresses so shabbily" (ibid).

Thus, as the bottom fell out, a managerial layer above the operators grew and changed. In general, in the 1980s, "managerial trends" were "biased in favour of financial management" (Duménil and Lévy 2011: 84). From the mid-1980s, under the banner of New Public Management, market logic was applied to the public sector. This also meant cutting back on the work that the market was thought to be able to do more cheaply, so that contractors were found for most physical work.

Becoming a manager

The transformation from captain to operator to manager, and from engineer to manager, is illustrated here by the experiences of Ad van Zanten and Ruud Filarski.

Van Zanten recounted how an old-timer, with whom he took shifts as captain of a push boat, had taught him how to understand the dynamics of a crew. From the way Van Zanten spoke—resolute, confident, comfortable with being listened to, explaining the way things are—it was not hard to imagine him as a captain. As a rule, "the captain is always right" (Interview 17.4.18). The push boat had a crew of 14. The old-timer captain told him that every crew always had a "bastard" and that the trick was to find out who it was. Van Zanten said he would find out, and after three shifts he sent one crew member home, with almost two weeks to go. At the change of shifts, the old-timer came to the wheelhouse:

> Ad van Zanten: And then my colleague said: 'Have you stopped or something, have we anchored, what is going on?
> AB: Did you what?
> AvZ: I was not sailing where I was supposed to be.
> AB: Oh yes, you were behind.
> AvZ: Those guys [the oldtimers] saw it immediately, so yeah, you should have been 10 kilometres further or something. But I said 'no, we got rid of the bastard'.

> The old captain said to me: 'You didn't listen carefully: (…) there's always a bastard on board—we still have one now. I said: 'No, he's gone. He says: 'No, we still have a bastard on board, but now we don't know who it is.
> AB: Laughs.
> (Interview 17.4.18)

Van Zanten then linked this anecdote to his work at Rijkswaterstaat, where "you also meet people like that [bastard]" (ibid.). There he "always tried to see what they were good at" (ibid.). Here he seemed to move from discussing character flaws to discussing competence. It is not clear whether a 'bastard' is someone who messes up or sabotages things. He then seemed to switch to the perspective of Rijkswaterstaat as a manager when he went on to talk about a former secretary. He told her that she would not be happy to remain a secretary: "This is such a shame. You could go far." (ibid.) Together they determined a "career path" (ibid.). Eventually, she became the control room manager, of which Van Zanten is "a bit proud." (ibid.) When I asked for access to the control room in Dordrecht for long-term participant observation, this manager and her colleagues repeatedly refused.

Van Zanten had to follow management training, more than he "cared for", because it professed to avoid conflict and was "much too theoretical," yet theory did not cover the diversity of the 24 characters he had to manage (ibid.). He felt he was in "a robot factory, both for managers and for staff" (ibid.). To a degree, Van Zanten seemed to stuck to his old ways. He stood firmly behind his staff to protect them from pressure from above and told his superiors that "if necessary, I will be the one to give them a knock on the head" (ibid.). He recounted an incident in the 1990s when he did just that:

> Ad van Zanten: There had been a collision, only because of his [the operator's] negligence. And then he started telling this story, you don't want to know. And then I [makes a movement with his arm]. The operator says: 'What is this?' I said: 'You can't believe that I'm such an idiot that I believe your stupid rubbish? That you hold me in such contempt. This is what you get hit on the head for.
> AB: (chuckles)
> AvZ: That minute and a half that he didn't pay attention, I think it cost me at least twenty hours to get it right with the prosecutor. Because there were people who were injured, and then it becomes a matter for the police. (…) I had told the operators many times before: 'Remember, you are responsible for the information, not, again, when two ships decide to collide you won't stop them, but when you haven't made a call, you will be the mug. You have to call, you can prevent it, just with your trap: 'Ship ahead 600 metres, ship ahead 400 metres'. And then you shout louder, at the end: '[name of ship 1] you have to stop, [name of ship 2] you have to stop'. And if you haven't done all that, you're the fool. I said [to the operator, whom he slapped]: 'And what you are forgetting, one thing, if it is negligence,

> then you are liable, legally speaking, and uhm, if you, uhm, then this employer, this organisation will let you hang. (Interview 17.4.18)

My laughter (like my laughter in the previous fragment) probably spurred Van Zanten on, which in this case makes me somewhat complicit, as it may have given Van Zanten the idea that I appreciated his violent behaviour. He also told the prosecutor that he had hit the operator and that the operator had indeed made a mistake:

> Ad van Zanten: I said: 'This is a wonderful operator, but he made a terribly stupid mistake. I've known this man for 15 years already, and I have not once caught him making a mistake and now he does this, because he is not watching the radar images, but because he is playing a game of cards on that thing [computer] during fog, which is unacceptable.' (Interview 17.4.18)

This is not the sort of thing that is taught in 'too theoretical' management courses. The honesty and loyalty that Van Zanten demanded may have made him the captain of the control room, and as on board, he saw a community that meant that problems were not solved by expelling the deviant crew member. The work had to be done anyway. In this sense, the 'bastard' present in every group, according to Van Zanten, is a matter of character and competence. He seemed to have a keen sense of risk, as do most skippers, but on board at least the physical risk is more collective.

However much Van Zanten seemed to resist what Rijkswaterstaat tried to teach what a manager should be like, he did remain the control room manager until his retirement. He must have done some things 'right'. He proudly told me how he had managed the reconstruction of the Dordrecht control room in 1996 well within budget: he spent only two thirds of the budget (Interview 17.4.18). At the time, he did not oppose the prospect of privatising Rijkswaterstaat (ibid.), which was discussed in the early 2000s after the organisation was hit by a massive scandal. He sat on a commission that screened the entire organisation for redundant staff. He never supported the operators' claim that sailing experience was a prerequisite for control room work. He did, however, support their demand for a direct view of the water, although not with the same motivation as the operators: he asked a senior manager if he liked having windows in his office and said that the operators "should not feel cloistered" (ibid.) Van Zanten did not cling entirely to a skipper's knowledge and identity as the root of his authority, which probably contributed to his modest organisational rise.

Noordegraaf and Schinkel (2011) describe how, since the 1980s, the strategy of managers, especially in the public sector, has been to professionalise both in the classical way through formal education and associations, but also in a new way. The focus lies less on stressing autonomy and more on stressing interdependencies between them and other, more established professions (ibid.). By obstructing the efforts of

others to professionalise and by breaking up professional bastions, managers professionalise themselves (ibid). Van Zanten's role seems ambivalent in this respect. He frustrated the strategy by which operators tried to manifest their authority, which could then grant them professional autonomy, but he did not adopt the managerial identity through formal education, having mastered a way of leading before he ever became a manager.

Filarski spoke like an academic, much less colloquially, but in a way not unlike Van Zanten in that he too seemed used to being listened to, to explaining how things worked. By comparison, what he said was less wrapped up in anecdote and sometimes more like a grand narrative. Perhaps this was what I expected from him, given our shared academic background, having studied his publications and steered him in that direction. It seems that there were three roles Filarski played at Rijkswaterstaat: the classic civil engineer/servant (generally a role Rijkswaterstaat had fostered), the manager (when technical competence no longer cut it) and the historian (enlisted by the Corporate Dienst, but a way out nonetheless). He too did not seem to have fully embraced managerialism.

Filarski is the son of an entrepreneur, but he resisted the pressure to work in the family business and studied civil engineering at what is now the Technical University of Delft between 1965 and 1969—he was the first in his family to do so (Interview 7.1.18). Rijkswaterstaat is at the root of this discipline and study programme, and so studying there is the classic foundation for a career at the agency—where Filarski started in 1969. He considered himself, if not a member of the 1968 generation, then at least influenced by a sense of freedom and openness that motivated him, like many of his contemporaries at the agency, to sometimes defy hierarchical structures (ibid.). Over the years, he took on many tasks: he worked on the modernisation of the locks, where communication technology was introduced; he built up the nautical knowledge needed to change the course of the waterways or to understand the behaviour of the ever larger push boats; he mediated between the central board of Rijkswaterstaat and the minister responsible; he headed a department that studied waterway traffic. As already mentioned, he became a historian in the 1990s, obtained his doctorate in 1995 and has been publishing as an independent transport historian since his retirement in 2004. The fact that he has changed roles relatively often is significant when compared to Van Zanten and especially when compared to operators.

As quoted in the previous chapter, in the 1970s Rijkswaterstaat "saw that the civil engineering solution was no longer working" (Interview Filarski 7.1.18), which, I concluded, led to both a behavioural turn in infrastructure and a burgeoning awareness that local publics needed to be addressed differently in order to legitimise decision-making. Filarski saw up close how the then head of Rijkswaterstaat, Van Til, though a competent engineer, was not cut out to do this (ibid). Eventually, from the 1990s onwards, the public was involved in parts of the decision-making process, al-

beit reluctantly (cf. van den Brink 2010). Filarski recalled that in the 1980s they received "ukases from above that we had to think customer-oriented", but did not seem to identify much with New Public Management (Interview 7.1.18). Although he did not shy away from hiring consultancies from the start, he valued the days when the agency had most of the critical knowledge in-house. He did, however, wholeheartedly embrace one element of management professionalisation: formal training. Unlike van Zanten, Filarski felt he lacked the skills to manage a department. Or, more generally, that the Rijkswaterstaat engineers who occupied management positions (which was almost all of them until the 1990s) lacked the appropriate knowledge and skills. At first, they dealt with this informally. Through his supervisor, he got hold of tomes on organisation and management, which he found too rigid and "static", with hardly any mention of "human interaction" (ibid.). They were written by Van der Schroeff (1900–1974), who was one of the founders of business administration as a course of study in the Netherlands. The books only told him "how to organise an enterprise in a way that you had sufficient information" and "how to make people do the things they should be doing (…), although when managing, human interaction is of course very important." (ibid.)

On board, Van Zanten had learned through human interaction (in a community of practice), while Filarski had learned how to apply the laws of physics from books and lecturing professors. In the late 1980s, early 1990s, he said,

> Rijkswaterstaat sent us to all sorts of management courses where we just, er, yes, er, saw our own behaviour in the reactions of others. And around that time, a significant part of the top management of Rijkswaterstaat changed in a very short period of time. In the sense that, um, only people with good communication skills got to the top. And that communication skills were given priority over technical skills. (…) The courses were quite intensive. Over a period of a few months you would go out into the countryside four times for a week under the supervision (…) of two or three trainers. (…) Yes, an important part for some [participants] was just the human interaction that took place and the feedback on the human interaction. Sometimes there was also, um, yes, some things were done by acting out certain situations. We also did some survival training in the [Belgian] Ardennes. I for one learned a lot from those courses and I know a number of colleagues who felt the same way. (Interview 7.1.18)

The embrace of management courses seems to be rooted in a desire to treat people well, to be open and honest. I gathered from our conversation that this was not only a moral conviction, but also a pragmatic insight into how to get other people to be productive. Learning through formal education was a pattern Filarski was comfortable with. However, given Filarski's description of the didactic setup of the management course—acting out situations, introspection—the courses themselves

sound less formal and perhaps would not have been the same as the "too theoretical" courses Van Zanten had to attend.

For Filarski, formal training was an important indicator of competence. He was not involved in staffing the Dordrecht control room, but he was closely involved in staffing the new locks south of Dordrecht. Like control room operators, lock personnel (also called 'operators' by Filarski) were often selected on the basis of relevant experience rather than formal education. This was partly, he believed, because Rijkswaterstaat did not pay enough to attract formally trained people. Lock operators were used to working autonomously, but the new lock complexes built in the late 1960s and 1970s were designed for greater coordination between several operators and with the outside world via telex and marine VHF radio. Many of the lock operators were former bargemen, whose mistrust of policies designed by people without such experience was an obstacle: "This also explains why it was so terribly difficult to successfully implement restructured operations at the Volkerak locks" (Interview 7.1.18).

Running a lock complex was no easy task. One incompetent lockmaster in particular stood out in Filarski's mind.

> Because the work was paid poorly, severely underpaid for running a small modern enterprise, because of that you would not of course get the organisation skills needed from those guys. The lockmaster simply wasn't up to the task. He had his primary school education and his skipper's training and, er, yes, nowadays you would expect someone with a university degree to be in a position like that. And he treated his staff in a way that you would think 'that's just not smart, you don't get people to excel at their jobs like that'. He lived opposite the lock and in the mornings he would watch the shift change with his binoculars to see if people weren't late, and yeah, then you thought 'listen, you only have to shout at somebody once if they're late and that's it, but they should have the intrinsic motivation to be on time'. (Interview 7.1.18)

For his next major lock project, the Haringvliet locks, Filarski arranged better pay for the lockmasters, which allowed him to choose from a different pool: those with experience of deep-sea navigation. He considered those with deep-sea experience, mostly helmsmen, to be a cut above inland waterway skippers.

Part of Filarski's reluctance to fully embrace the managerialism of the post-1980s is reflected in the fact that he managed to escape the role when he became a historian, becoming productive himself rather than overseeing the productivity of others. Although he often had managerial responsibilities, he did not speak overtly in managerial terms, did not mention 'targets', 'clients', 'business cases', perhaps also because he wanted to be addressed primarily as a historian (and felt free to question the legitimacy of my research topic and the epistemological stability of my method). He

did, however, mention that he had tried to 'implement restructured operations' and was familiar with major organisational changes. He explained the demise of DGSM, which was involved in a power struggle with several government organisations, including Rijkswaterstaat, by saying that "people who have too many staff usually start fighting with each other" over jurisdiction (Interview 7.1.18). Here he implicitly combines the dynamics of Dutch bureaucracy with managerial notions of efficiency and redundancy.

Managerialised and mediatised work

Operators experienced the rise of managerialism in roughly three different ways: 1) they became increasingly isolated within the organisation, but gradually had less autonomy; 2) this was the result of formalisation through protocols, through the measurement of work (intensity) by both consultancy firms and the operators themselves, which was part of a wider trend for non-managers to adopt managerial language and thinking, and managerial strategies also materialised in the mediatisation of work; and 3) at a later stage, after 2004, the traffic control rooms became a focal point of Rijkswaterstaat's 'network management' ambitions.

The first point is somewhat ironic. The outdoor divisions were stripped when Rijkswaterstaat started to prefer outsourcing maintenance and repair work. With the control rooms located in riparian land, close to the waterway, these were the colleagues operators were closest too. Only the river masters and their crews were left, but they had been reduced in numbers when the control room afforded a manoeuvre instead of a patrol strategy. In both Tiel and Nijmegen the managers have their offices elsewhere, and in Dordrecht they were downstairs but left before the operators and have not moved to the new control room location.

While in the organisational periphery, operators learnt to read the signs. Fokko Boersma mentioned—when asked about his general impression of the agency where he worked for almost three decades—that the degree to which operators were allowed to contribute depended on the economic tide: during downturns, you had to do what you were told by management and policy advisors (Interview 4.1.18). Similarly, Jan Timmer deduced that when access to the control room was more restricted and only agency hotshots visited, budget cuts were imminent (Interview 20.2.18).

The second point, formalisation, was the cause of the loss of autonomy. The work was defined more narrowly, to which Van Zanten also contributed, and accounting became more important. Dirk Zwijnenburg felt that, in contrast to the early, informal days, "everything had to be accounted for and arranged long in advance" (Interview 5.1.18). The materiality of the formalisation process is crucial here, as managers were not present enough, especially during night shifts, to monitor the control room operators. So it matters that, in addition to VHF radio conversations, radar images were also permanently recorded; it matters that operators made entries in a national

database for ships with special cargo or size; it matters that the shipping log was kept in a digital format that could not be altered once it was saved; it matters that operators later on knew that whatever else you were doing on digital devices, for example playing a card game, could also be reconstructed. Surveillance was an element of formalisation.

A persistent site of contestation was the intensity of the operator's work. At the beginning of this chapter, we learned that operators initially worked twelve-hour shifts, often with little time to go to the toilet, let alone eat (Interview 5.1.18). In order to prove this, the operators began to keep meticulous records of their work activities. In 1984, Dirk Zwijnenburg wrote a report detailing the average number of actions per hour, which amounted to one minute and twenty-one seconds per action. He concluded that "the operators in the control room in Dordrecht are very intensively occupied" (Zwijnenburg 1984: 11). This meant that they needed a separate marine VHF frequency to communicate with ships, rather than the standard frequency used everywhere. A second, equally modest, demand was an overlap of 15 minutes during shift changes. He also concluded that it would be impossible to take on more responsibility in the current set-up. To quantify work in this way is to translate it into a format that can travel within the organisation, it was to adopt the managerial "evidence-based" logic (Noordegraaf and Schinkel 2011: 106). Not only does this potentially plant the seeds for later accusations of inefficiency, but it also fundamentally allows for conversations about work without having to discuss the work itself, just the numbers.

It was not until 1990 that Berenschot, a renowned Dutch consultancy, was commissioned to carry out a study of work intensity. It largely agreed with what operators had been saying for almost a decade and would eventually lead to a renovated control room with better equipment (cf. Verschoor and Giessen 1990). However, it also meant that the intensity could not be accurately determined until the control room mandate and job descriptions were more precisely defined (ibid.). Acknowledging the harsh working conditions would therefore also lead to less autonomy, since we know that formalisation has not been on the operators' terms by and large.

During my days in the field, I rarely spoke to a Rijkswaterstaat employee who had not adopted some of the managerial vocabulary. During my first visit, one operator said that "our customers should complain" about the understaffed control room (Field note 8.6.15). More than just language, this implied a logic: the expectation that this is how Rijkswaterstaat works, that it wants satisfied customers, and that their dissatisfaction would prompt Rijkswaterstaat to act. Neoliberalism teaches both managers and professionals, in both the public and private sectors, to "see the world from the perspective of investors" (Graeber 2015b: 75). A senior policy advisor in the agency's nautical department whom I interviewed spoke casually of 'business cases' when he meant policy proposals (Interview 29.4.16).

The mediatisation of control room work, of which simulator training is both a cause and an effect, allowed management to ground operator work in something other than the elusive experience of sailing the north-west European waterways. It demarcated training and made it more evidence-based, i.e. skills were expressed through test scores, through formal assessments by an external training institute. Many oldtimers went along with this shift, partly because they were given a prominent role as 'coaches', which conveniently gave them an informal role in a formal process. The veterans could see themselves as the authority on the progress of the newcomers, while the examination of the newcomers was carried out by an accredited course funded and controlled by the operators' main employers.

When operators in inland navigation control rooms base their expertise on shipping, they draw on tacit knowledge, which is knowledge "embodied in people rather than words" (MacKenzie and Spinardi 1995: 44). In a study of nuclear weapons designers, the reliance on tacit knowledge "might even be seen as the self-justification of an elite group whose profession is under threat" (MacKenzie and Spinardi 1995: 44). By comparison, operators are not an elite group, and while it is impossible for an outsider to say whether the nuclear scientists were right, I have observed many instances where tacit knowledge in shipping appears to have underpinned successful interventions in waterway transport. This is not to say that these situations would have led to disasters without this knowledge.

In contrast, managers do not invoke tacit knowledge, and at times not even any knowledge of shipping. A person in a senior position in the field of inland navigation who was a skipper several decades ago, worked as an operator and has had several managerial roles—told me that there are hardly managers at Rijkswaterstaat with practical knowledge of shipping and control room work. On condition of anonymity, he told me that he had recently confronted the head of the department's nautical division with this shortcoming. The reply he received was that this was deliberate, as expertise only hinders organisational change. In this way, the management's ignorance of shipping, which is seen as a shortcoming by the operators, is also a deliberate distance.

This brings us to the third and final point, where the work of the operators is further intertwined with the objectives of the organisation. In 2001–2002 Rijkswaterstaat turned out to be one of the main victims of fraudulent tender procedures in major public construction work, known as the Bouwfraude. This triggered a reorganisation of Rijkswaterstaat, a long-term process that began in 2003. The head of the organisation deemed Rijkswaterstaat "inward and financially out of control" (Keijts paraphrased by Metze 2009: 21). To fend off a privatisation, the agency wholeheartedly embraced corporate principles: further centralisation, cost-oriented, more efficiency, customer-driven, more outsourcing (cf. Metze, 76). In came a management guru and his consultancy firm, who said he "believed deeply in financial incentives and the pillory effect: who is the best and who is the worst?"

(Samhoud in Metze: 59) The main mission was to become 'public-oriented', a Rijkswaterstaat translation of the customer-oriented principle. Both a national audience and those directly affected by Rijkswaterstaat's work were seen as relevant publics (cf. Metze, 78–79). One element of this was the to have "more yellow on the road and the waterway," as one member of the board put it (Aalbersberg in Metze: 91). Just as blue is the colour of the police, yellow would be the colour of Rijkswaterstaat. The police version of the phrase has been a mainstay of Dutch political discourse for at least the last 20 years, and is both a reaction to a deeply bureaucratised organisation and a light version of US 'broken windows' policing.

But there is a more important element to this public-oriented approach. The Nijmegen control room, inaugurated in 2004, became an early symbol of this new approach (cf. Metze: 77). Although the inland navigation control rooms had not been without prestige and publicity, as shown in this and the previous chapter, the aims in Nijmegen were more ambitious. The architects wrote that they had been encouraged to design a "recognisable, reliable and unique" building (Meer 1999) rather than the usual pragmatic design (Figures 9 and 10). The in-house magazine, then called Netwerk, celebrated the Nijmegen achievements; "About 165 thousand ships pass this point every year, transporting about 160 million tons of goods from A to B. The amount of accidents on this difficult stretch of the river is minimal. And that is quite an achievement." (quoted in Metze: 77)

Rijkswaterstaat began to describe itself as a "public-oriented network manager", and the new motorway traffic control centres, which were also architecturally striking, were celebrated for similar reasons in Rijkswaterstaat's in-house magazine (cf. Metze: 172–5). Like motorway traffic management, where the focus is increasingly on traffic flows and less on individual junctions and incidents, the waterway control rooms were also supposed to zoom out. In addition, Rijkswaterstaat's nautical department was given a new slogan: "Dependable on the waterway", which did not seem to impress the operators very much. One is quoted as saying: "It's a nice slogan, but it was obviously thought up in an office. In practice it doesn't make any difference to us" (Metze: 185). This confirms the distance between the control room and the main offices, where the slogan probably originated. Initially, the new ambitions were accompanied by investment, but when the financial crisis hit in 2008, this was followed by more than a decade of zealous austerity in the Dutch public sector. Large infrastructure projects, traditionally the showpieces of Rijkswaterstaat, became even less likely.

One prestige project after 2008 was the Maasbracht control centre, where Rijkswaterstaat centralised the control of six lock complexes along the Meuse and the Juliana canal, which bypasses the difficult section of the river. The design of the building (Figures 11 and 12) responds to the desire for more visibility, and much more so than the Nijmegen control room, it is built to receive visitors (although the Nijmegen control room also has a meeting room available to non-operating staff).

Figure 9: Artist's impression of Nijmegen control room situated in riparian land west of the city. Figure 10: For comparison, the Tiel control room, Cold War-proof.

Figure 11: Entrance to the Maasbracht control room. Figure 12: Courtyard of the Maasbracht control room, with the curtains of the control room on the first floor closed.

A manager I knew from the Dordrecht control room, Marc, was working there at the time of the 2015 conflict and refused to allow me long-term access there. His departure had not been entirely voluntary, it was said. He promised that I could visit the brand new control room in Maasbracht, where he would be transferred. When

I tried to take him up on his offer, he backed down (Email 13.10.16). He pointed out that part of the problem was that my research had not been commissioned by Rijkswaterstaat (ibid.). At the very last minute, Marc allowed a more limited visit than originally agreed.

Figure 13: Two parallel locks, one for upstream and one for downstream traffic, operated remotely from Maasbracht in 2016.

Marc and his subordinate, the floor manager of the control room, welcomed me and said that they expected the operators to be "hostile" to me, that they would just be annoyed to have a researcher around (Field note 19.10.16). The same was said of the Dordrecht operators. But whenever I was there, the Dordrecht and Maasbracht operators were, on the whole, friendly and accommodating to me. Later, the floor manager gave me a tour:

> These people have a low stress tolerance,' he says, adding: 'They come from the locks and could do without the distraction. By the latter, I think he means my visit. The room is large enough for the operators not to hear what he says. 'We have been operating for two years and have pretty much mastered it now.' He explains that the system is designed to follow the water downstream, which is the order in which they set the consoles. Within a console, the lock is always on the left for upstream vessels and on the right for downstream vessels. In reality, it is the other way around at some locks (Field note 19.10.16).

The perceived limited capacity of operators is quickly followed by the admission that they have significantly redesigned the way they work because of centralisation. Not only do the operators have to make do without a direct view of their locks and local conditions, some of them also have to operate mirrored locks, although in the event of a system failure all the locks have to be operated locally again. Rijkswaterstaat has vehicles on standby for this eventuality.

I ended up spending a couple of hours with the operators at their consoles (Figure 13). One, a former skipper on the Maas, said that they had been "driven into this tower", referring to the new central control room, and added that "we all dreaded the prospect" (Field note 19.10.16). As he finished planning the next lock in a digital interface, he said, "It's important to know the waterway, because then you can judge if you can still wait for a ship" (ibid.). Before I left, I was debriefed by Marc in his office downstairs as the final preparations were made for the grand opening of the control room, which was attended by EU dignitaries. I was excited, partly because I found the place genuinely fascinating, partly because I wanted to escape the atmosphere of negativity and obstruction to ensure future access to the site. Marc was single-minded: "Operators are easily distracted, he said, "and have an opinion on everything." (Field note 19.10.16) When Filarski later told me about his search for a more sovereign manager for his lock complex (as discussed above), I immediately thought of this field experience.

2.7. Conclusion

Three levels need to be distinguished in order to understand how navigation experience became irrelevant to the work of operators: profession, mediatisation and organisation. First, skippers-turned-operators failed to achieve professional status on their own terms. They got caught in the system of professions, first in the rivalry between pilots and port operators. Where the former had claimed ships and water as their domain, the latter had claimed the interface as their synthesis. The skippers-turned-operators were more like the pilots, having grasped the many variables involved in the sustained manoeuvrability of a vessel after years of living on it and rising through the ranks, but they were grouped with the port operators, mainly former Navy radar personnel, who had already been working as operators for twenty-five years when the inland navigation control rooms appeared. The operators did not succeed either in acquiring the authority that comes with exclusive control of professional knowledge. Their experience of navigation has always remained intangible, unformalised, which has made it easy for managers, the other professional competitors, to make the operators sound irrational; a classic move (cf. Noble 1977).

Many different managerial roles have been reviewed in this chapter: the captain and the engineer acting as managers, the manager monitoring and gatekeeping,

and non-managers internalising managerial thinking. Although the manager may have previous expertise, it is perfectly legitimate, even desirable, to have no expertise at all, except perhaps knowing how to prevent others from capitalising on their expertise and gaining autonomy.

In contrast, the skippers-turned-operators had an existential approach to work. Work as a domain of masculinity (think of the first computer called Birgitte) was transferred to the control room. Men at the helm became men behind the console and stayed there for decades. Nowadays, the old-timers see new operators seeking upward mobility and pursuing careers outside the control room, which requires pragmatism rather than idealism to overcome the isolation of the control room. The Racon Guild was disbanded in 2016 after failing to find new members for the board—it had been in hibernation for a few years. "Operators are no longer crazy about the job," Dirk Zwijnenburg said (Interview 5.1.18).

Second, mediatisation (itself to a large extent made possible by digitalisation) has allowed the locus of observation to change. One might expect that when technology is used to control the way work is done, automation would be a key concept in this chapter. However, not much has been automated in the work itself: mainly administrative tasks and, most importantly, the identification of ships. Mediatisation has changed the social conditions of learning; the intimacy of expertise has given way to training that is repeatable, measurable and therefore accountable. For example, the operator in the Antwerp control room quoted in the introduction could make the comparison with air traffic control and point out that former pilots do not become operators—in his understanding, knowledge of software and protocols is more important than an understanding of aircraft.

The practices and standards of the port control room operators were reflected in the simulator training. As a result, admission to local control room training, to legitimate peripheral participation, which is now the second level of training, was no longer based on maritime or naval experience, but on simulator experience. The formalisation of work led to clearer and more narrowly defined tasks, with nautical media at the centre. A complex understanding of the needs of the users of the waterway, the waterway itself and the other creatures around it was no longer required. Improved accuracy, new affordances layered in interfaces, and the centralisation of information moved the action to the screen and gradually reduced the relevance of access to the waterscape through the windowpane.

At the third and final level, we find the organisation capitalising on mediatisation. It gives the agency access to an accountability that sounds rational compared to the emotional operators. Operators blew the whistle on their agency in 2015, saying that austerity had left the control room exposed. National and regional media and trade journals reported on operators breaking ranks. Questions were asked in parliament, but the responsible minister denied any danger and reassured the public that the work could be done more efficiently, and therefore with fewer people,

thanks to 'technological innovation' in the form of AIS (cf. Schultz van Haegen 2015, 2). What was once the exclusive perspective of the control room, initially through its elevated perspective on the water, has increasingly moved to the screen and has now travelled to the ships that the operators once left. Mediatisation made the operator's perspective mobile.

Since then, this pattern was used as a strategy to limit the Dordrecht control room when again local politicians, after several incidents, pressured Rijkswaterstaat to control the Dordtsche Kil and the Hollandsch Diep intersect, south of Dordrecht (cf. Koster 2020). Operators would also find it useful to extend the radar network, according to operator Rolph (ibid). Rijkswaterstaat has communicated publicly that it could meet these demands without extending the radar network of the Dordrecht control room (cf. Rijkswaterstaat 2016; Rolph 2017). What was not mentioned was that more radar coverage would have meant an expensive additional sector for the control room. Centralisation was once a cost-saving strategy for Rijkswaterstaat, but distributing the control room perspective seems to be more economical.

Rijkswaterstaat again communicated that skippers have been equipped with AIS, which enabled them "to anticipate to dangerous situations earlier in order to avoid undesirable altercations." (Rijkswaterstaat 2016) As an extension of this strategy, Rijkswaterstaat stated that it was developing "dynamic apps for recreational skippers" with which they could 'improve traffic awareness' for recreational skippers (ibid). In response to local concerns, the VHF radio coverage of the control room has been improved. Furthermore, the focus on "route-oriented information" enabled operators at locks and in control rooms to "proactively inform skippers" (ibid.). Thus, the role of the "network manager", and the similar pet project of nautical policy advisors called "corridor management" (Interview 8.6.15), is to zoom out and to gradually disengage from coordinating passings.

Coincidentally, this probably means less intervention by the operators and thus less intensive work. Only in 2002, after many years of lobbying by the operators, did an early retirement scheme enter into force. This was obviously a very costly arrangement for the Agency, which it succeeded in overturning in 2015. So, while the ambition of 'network management' or 'corridor management' may require investment in media technology infrastructure, it also keeps staff costs in check.

Some operators have returned to skippering after taking early retirement. Their skills are in demand now that the inland navigation communities of practice have been hollowed out. Ad Van Zanten explained that he tried it for a while, but could not cope. In the 1970s, he noticed that he always struggled during night shifts between three and four o'clock—that's when his body seemed to give up. In those days he had company in the wheelhouse, a game of chess was played, stories were told. If necessary, someone else would take the helm and he could get some fresh air on deck. Now he had to work twelve-hour shifts alone (Interview 17.4.18). Wheelhouse dashboards have come to resemble control room consoles, all relevant information is

centralised—this is where mediation began, the first generation of operators transferred mobile media to the control room. With action moving to the screen, the skipper can work on his own, having to pee out of the window if push comes to shove.

Chapter 3 – Control room Prestige and Design intertwined

Control rooms as circulating images and as architecture are complementary. De Vaujany and Vaast write that "organizational legitimation" is often visual, and that "then (…) both image-object and image-screen iconographies" are required (2016: 765). By image-object, they mean a "material sign" that needs to be experienced in a given context to "fully convey its intended meaning" (768), such as a control room in a river landscape. Image-screen iconographies, on the other hand, are "meant to be distributed, reproduced, transformed and commented upon" (ibid.), like the long visual tradition of the control room, and not unlike the circulated tweets discussed in the next chapter.

There are three main sections to this chapter. First, the tradition of making control rooms visible for organisational purposes, including how the interior is shaped by this desire. The focus is on infrastructural control rooms, and gradually the control rooms of Rijkswaterstaat are zoomed in on. Then, in section 3.2, I take a closer look at the two main academic discourses on control rooms for this study and their obvious and less obvious links to the visual tradition of the control room. The final section uses the practices of gatekeeping as a lens to focus on the shifting interplay between prestige, working practices and organisational dynamics.

3.1. Traditions of making the control room (work) visible

To whatever extent the control room has been made visible, it has never been done by the operators themselves. Control rooms have been mobilised for state legitimacy (Figures 1, 2 and 3), to demonstrate military power and reach (Figure 4), to discipline and reassure by displaying urban surveillance (Figure 5), as a geopolitical marketing tool (Figure 6), to boast about corporate management (Figures 7 and 8), as a "topos" (Huhtamo 1997) in imagined techno-futures (Figure 9), to depict dystopia (Figure 10), as an automated liability in a networked world and a vehicle for teenage deviance (Figure 11), as a backdrop to lend authority to whatever is said (Figure 12), as evidence

of the state's ability to monitor and regulate mobility (Figure 13[1]). What all these examples have in common is that it never really matters what the operators are doing there, but that these places exist as such—the medium is the message. Concretely for the Dordrecht control room, what is remarkable, is that initially the managers got to present it in the local press. The first exception I found was an article in an inland navigation magazine—a completely different audience—in which Dirk Zwijnenburg and Ad van Zanten explained in detail what the operators were trying to do.

In the control room of Prorail (the Dutch state agency responsible for rail infrastructure) in Rotterdam—which I was allowed to visit for two hours after persistent lobbying by contacts in the organisation—I saw that most of the consoles had a sign on the back indicating what was being controlled (type of train or region). There were also two large screens on a wall, which no one seemed to be interested in, showing a live map of the Netherlands with all current and resolved train disruptions (Figure 14). Many of the dispatchers did not have a clear view of the screens or were too far away; they were behind walls of screens with very different representations of smaller sections of the network (Figure 15): Latour and Hermant's "small wholes" (2006).

1 Van Rees was once a traffic policeman in a Porsche convertible, then got a desk job in the Driebergen motorway traffic control room, from where he read out the traffic information on national radio (a task long performed by the Dutch police, but more recently taken over by Rijkswaterstaat). Requests for television interviews grew as congestion increased, so he converted a corner of the Driebergen control room into a makeshift television studio, with his colleagues working in the background (Hout 2008). In 1997, shortly before his retirement, Van Rees appeared as himself in CRISIS (Emans 1997), in which famous politicians dealt with a simulated crisis, ranging from major environmental disasters and nuclear accidents to terrorist attacks -Rijkswaterstaat was given a prominent role in several scenario's. This hour long show ran from 1997 till 2002 on Dutch public television. I was in contact with Van Rees, but he suffered a stroke before we could meet and passed away in 2019. The show always ended with an expert called Uri Rosenthal—who with his team had also designed the fictional crisis scenario—reflecting afterwards on how the politicians had performed. He judged performances for a large part on communication with those sections of the public affected by the crisis. In addition to his academic position, he founded a crisis management company, and trained many politicians from the conservative party (VVD). Rosenthal later became a prominent politician in his own right, reaching the position of foreign minister, despite having no experience or training in this field. Most of his cabinet colleagues had once done a training at his company or were his former employees. This vision of politics as crisis management echos the Rijkswaterstaat management practice, as discussed in chapter two. Expertise lies in crisis or reorganisation, regardles of the context.

Figure 1: Photograph of the inauguration of the Hoek van Holland control room by Prince Bernhard in 1956, now hanging in the corridor of the same control room, which is part of the Rotterdam control room network. Figure 2: Photo collage accompanying an interview with Rijkswaterstaat motorway control room operator Petra Lubbers, a former naval signal operator, published in 1998 to commemorate the 200th anniversary of Rijkswaterstaat. In the interview Lubbers describes her job as "Big Brother is watching you, but your heart is in the right place." (Bendeler et al 1998, 102) Figure 3: Photo of Dutch King Willem-Alexander of the Netherlands (standing left) and Minister of Infrastructure and Environment Schultz van Haegen (far right) visiting Traffic Center Helmond 2015.

Figure 4: Drawing of a Luftwaffe operations room which appeared in Signal, a Nazi propaganda magazine published in several languages throughout Europe in occupied countries. This is the Dutch version of an issue from 1944.

Figure 5: 2016 photo of an underground control room in Shanghai, visible to the public through a window, with text in (both Mandarin and) English: "Station Control Room". For several years there was a similar control room at Berlin's Alexanderplatz underground station, where you could speak directly to the BVG operator through a circular window. Sometime in 2019, an updated version of the control room was closed.

Figure 6: Four stills from Gazprom's 2013 commercial, aired at the start of every Champions League match, the world's most lucrative and popular club football tournament. It shows the natural gas pipeline network and zooms in on the control room of which it is a part. It then shows the ephemeral energy flowing from the taiga to the football pitch, which is being watched on television. The last image is the final frame of the commercial. Gazprom is a state company with a revolving door to the Kremlin. The Russian invasion of Ukraine and the sabotage of the Nord Stream pipelines in 2022 have since made such advertising unthinkable.

Figure 7: Two photos of the Du Pont Chart Room, the first from 1919, the one below from 1950. The second appears in Yates' Control Through Communication (1989) and was "a direct answer to this problem of information overload." (266) It was made public when the company "hosted a series of presentations about the chart room, the techniques it employed and 'management by ROI' [return on investment] at a financial conference hosted by the American Management Association" (Castellano 2015).

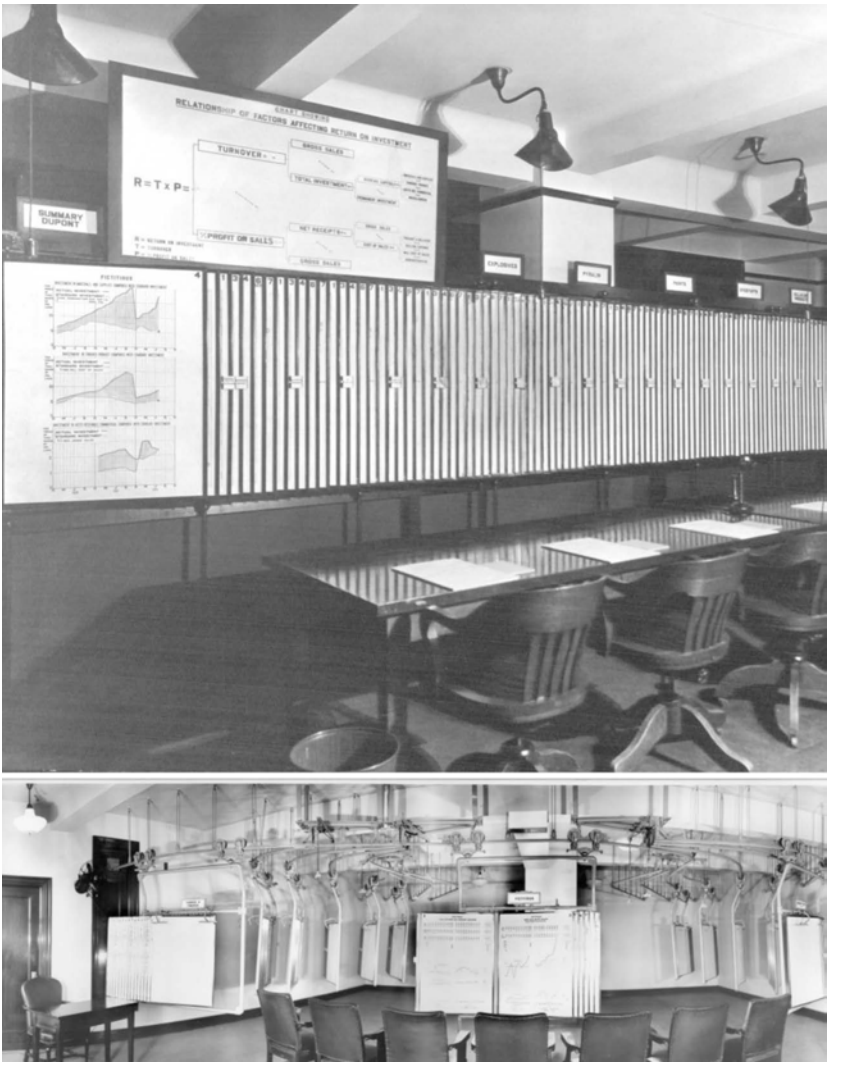


Figure 8: First an artist's impression of the SAP Boardroom from 2016, and then a screenshot from a 2020 promotional video by SAP on the German football club TSG Hoffenheim, owned by the founder of SAP. Here, the table has touch screens built into it. The text on the wall to the right reads "the future is now."

Figure 9: Drawing that appeared in Fernbildtechnik und elektrisches Fernsehen by Peter Lertes (1926), an engineer from Leipzig. The airplane has "elktr. Augen" in all directions which correspond with the monitors in the console below. Like figure 4 (bottom left) the artist has 'cut open' the hardware to show what is inside.

Figure 10: Still from thx1138 (Lucas 1971a), shot in Bay Area Rapid Transit control room in 1971. In the short film made to promote it (Lucas 1971b) Lucas says "if you were to make a film about the future, the way to do [it], would be to use real things, because we are living in the future." As a result, thx1138 used only existing locations: industrial and infrastructural control rooms in and around San Francisco. The movie's tagline was "the future is here".

These elements could, of course, also anticipate representation. A large screen (Figure 16) was set up in the WSV (Wasser- und Schifffahrtsverwaltung des Bundes) district centre in Duisburg, on the banks of the Rhine:

> When I asked what was wrong with the big screen in the left corner, which was switched off, Bert said: "It broke down because it was just standing there, not being used". "Curious," his colleague Joachim interjects. The screen was supposed to monitor a certain section in case of a "havarie"; they could also run the MIB ("Melde- u. Informationssystem Binnenschifffahrt") on it. But the thing was too warm and made too much noise; the colleague sitting all the way to the left would be really bothered by it, so they switched it off. It also runs on XP, and they now have Windows 7 on their consoles. It would have cost between 30,000 and 40,000 euros to update it and they felt it was a waste of money. (Field note, 19.4.17)

On my way out, I picked up a flyer at the entrance with the big screen on the cover (Figure 17). There, it was not broken yet, and showed an image of a ship on the Rhine, which could suggest it is a live CCTV feed, given how most inland navigation control rooms work or are depicted, while it must have been just a photo. The slogan of the WSV is "wir machen Schifffahrt möglich", as the leaflet shows. But the operators do not use their direct view of the Rhine. They maintain a database of who is on the river with what cargo by communicating via marine VHF radio. In fact, they keep the blinds closed for ergonomic reasons.

Figure 11: Poster for the movie wargames (1983), in which a teenager hacks the North American Aerospace Defense Command (NORAD) control room, depicted in the top half. The movie addresses anxieties about automation, artificial intelligence and the virtual, while implying that with the advent of personal computing this is no longer such an exclusive domain. Over the years there have been tours for civilians, when it was located in the Cheyenne Mountain (1956–2008) and when it moved to the nearby Peterson Airbase, also in Colorado.

Figure 12: Screenshot of an interview with the head of the Royal Netherlands Meteorological Knstitute (KNMI) aired by the NOS, a Dutch public broadcaster, at prime time. The item was about climate change causing extreme weather, which brings climate science and meteorology together in a complicated way: a thirty-year average and a short-term prediction. In the Netherlands, with its long coastline, storms are a common phenomenon, and weather warnings are often given in different colour codes. The item said the KNMI has now issued a code orange for our climate. In such coding systems green is safe and the closer to red is dangerous. In the many popular representations of war rooms similar coding schemes are used, in WARGAMES *to indicate nuclear alert. Since the 2000s several countries have implemented coding schemes to indicate the likelihood of a terror attack. What these examples have in common is an implied centre from which this is issued, a place with a superior information position and the authority to judge.*

Thus, only when the aim is to represent the work, to show what it is that the organisation makes possible, a photo displayed on the otherwise disfunctional large screen makes sense.

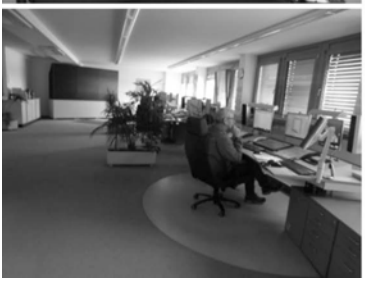
Beyond the inauguration or a working visit by a dignitary, which are always staged to a degree, infrastructure is invisible. Some of the key properties of infrastructure are that 1) that infrastructure is embedded, it "is sunk into and inside of other structures, social arrangements and technologies," 2) that it is "transparent to use, in the sense that it does not have to be reinvented each time or assembled for each task, but invisibly supports those tasks," and 3) that the "normally invisible quality of working infrastructure becomes visible when it breaks" (Star 1999: 381–2). It may even be inherent to service work: "that the better the work is done, the less visible it is to those who benefit from it". (Suchman 1995: 58) It seems that the Dordrecht control room became much more visible because of its faltering operation,

because that is how I noticed it. In general, it is the norm to emphasise publicly how much the state is in control, which in the case of the Dordrecht control room is mainly done locally.

In her article "Making work visible", Lucy Suchman (1995), who has written extensively on air traffic control, explored the tension between the representation of work by workers or by the larger organisation. To begin with, she wrote: "[t]o a large extent, representing work is the stuff of which organizations are made." If we briefly return to the KNMI Weather Room: for a different research project Simon Hirsbrunner and I interviewed all people involved in making a news item for prime-time television that featured the Weather Room (Figure 12). However, the head of the KNMI said that the Weather Room had nothing to do with the item itself, but that journalists and viewers "are not interested in a boring office" (Interview 15.7.16). It is thus more difficult to represent work, at least symbolically, when the workplace is generic.

Figure 13: Still from the 1997 Dutch television show CRISIS*, in which the famous highway traffic control room spokesperson Rob van Rees played himself, see footnote 8.*

Figure 14: The screen at the Rotterdam rail dispatch centre ("Verkeersleidingpost"), which none of the operators can read, photographed in 2017. Figure 15: The live positions of trains for the purpose coordination purposes are displayed in abstract linear diagrams. Figure 16: The Duisburg WSV Revierzentrale in 2017, with the large screen switched off at the back, left, and the venetian blinds closed on the right. Figure 17: Scan of the leaflet of the Revierzentrale with the screen turned on at the back.



The representational tradition of Rijkswaterstaat

This also applies to Rijkswaterstaat's managers and policy advisors. After the switch to 'network management', the control rooms became an important place to represent, where in the past ingenious sluices, improbably long dams or aqueducts could be used to represent Rijkswaterstaat's work. Although the Dordrecht control room is open to a limited number of visitors once a year (as part of the National Day of Inland Navigation, which will be discussed in the last section of this chapter). Representation is a way of reaching a wider audience. Basically, "[r]epresentation is creating

an image asserted to stand in place of or speak for another; an imaging developed through engagement with the other but then taken off, to some distant site." (Suchman 1995) This is why Rijkswaterstaat has photographed its control rooms over the years; material that is freely available.

Figure 18: The Tiel control room photographed during the 1998 high water. The caption Rijkswaterstaat has given it says: "A traffic post [verkeerspost] is a location of the Dutch Vessel Traffic Service, which coordinates and steers traffic on the Dutch waterways. In addition, the traffic posts keep an eye out for unusual circumstances, breakdown, accidents and environmental damage. The traffic controllers [verkeersleiders] of Rijkswaterstaat, also called VTS-operators, give skippers information about traffic and the local conditions of waterways via marine VHF radio." Figure 19: Operator in the Schellingwoude control room, photographed in 2014. Figure 20: This photo has no other caption than "computer images" and was taken in 1988. It shows the database operators monitoring of the movement of ships of exceptional size or with dangerous cargo, separating upstreamd and downstream.

The photographic material of inland navigation control rooms in Rijkswaterstaat's image archive, which is fully digitised and available online, can be divided into roughly three categories: 1) the control room as part of the (infrastructural) landscape, 2) the interior of the control room with one or more operators behind a console, and 3) close-ups of interfaces. Most of the material falls into the first and second categories, the third being an exception. In the case of the control room in the landscape, there are also a number of photographs taken during periods of high water (Figure 18), with the control room as a solid presence in a liquid world. The most typical photographic representation of Rijkswaterstaat's infrastructural control rooms is an operator at work in a static, slightly posed position (Figure 19). Of the third category, I only found photographs from the 1980s and 1990s (Figure 20), of which I have no idea if they were circulated and how often.

My reading of these images is rooted in both my observations in the field and my own attempts to photograph control rooms and operator work, and to capture their interfaces. I photographed these with two purposes in mind. One was to study the

images afterwards, when I had time to stare at them without disturbing an operator, and both to make sense of what was happening—although, especially in the beginning, events often simply unfolded faster than I could comprehend them—and to study the interfaces, trying to understand what was being mediated and what use the software was allowing. The other purpose was to represent my field to my peers, as I have done in my presentations at my institute's colloquium, at workshops and conferences, in articles, and now here.

In retrospect, I appreciate more and more how these efforts actively position me in the (sometimes) diverging interests in the representation policy between operators and Rijkswaterstaat. Unlike writing notes, taking photographs was not a task I could hide behind. Having once taught a course on the history of (art) photography, I'm sensitive to the specifics of the medium and the ethics of how taking someone's photograph can be a possessive act (cf. Sontag 1977). It often took me some time to feel confident enough to take the camera out, and I asked permission from each person I photographed. They knew the purpose of my presence and my interest in photographing them. Although no one refused to be photographed, some were clearly more comfortable than others. Some thought they should get out of the way, that my interest was primarily in their setup, others questioned my mode of photography or set boundaries. A small episode in the Nijmegen control room at the beginning of my fieldwork stands out in this respect:

> When I asked if it was OK for me to take photographs, operator Sander said it was fine, as long as I didn't take a quick picture while he was using the binoculars. He says that media professionals that visit the control room always want that you grab the binoculars, although they hardly use them anymore. (Field note 6.12.16)

No one else ever mentioned this. One could read it as going against the demand of many operators to have a direct view on the water, but I mainly understand it as a complaint about having to enact someone else's idea of an operator, about being represented on someone else's terms. As a result, I have never photographed an operator using binoculars, although it has happened often enough.

There are very few moving images in the Rijkswaterstaat image archive that might show operators at work. The only thing I found was some raw footage shot in the Dordrecht control room in 1996, which includes some close-ups of interfaces and some audible fragments of radio. One of the operators I recognise from his voice as Fokko Boersma, whom I met more than twenty years later (see chapter two). At first it seems that he is working in the Heerjansdam sector, which includes the Oude Maas—Dordtsche Kil junction. But then a voice from behind the camera says: "The push boat has called you now". Fokko is wearing a headset, so this part does not need to be acted. A few seconds later, he breaks the fourth wall, looks twice into the camera (Figure 21) and says "just give me a signal when I can talk". The voice

behind the camera says "OK" and Fokko continues pretending to call a ship. Later, another operator is instructed to look through binoculars. This last instance has a more alienating quality, whereas the simulation of marine VHF radio interaction is a key component of simulator training, where oldtimers then play skippers and newcomers play operators.

Figure 21: Still from raw footage retrieved from the Rijkswaterstaat image archive. Fokko Boersma looking the camera in 1996.

It is the deviation from the norm that shows what the norm is in the first place: in the representations, the operators never acknowledge that they know they are being recorded. It is shown that they are working, not much more than that. Unless they are broadcasters like Rob van Rees (Figure 13), but then they are not really working at the console. As for the close-ups of the interfaces: I have managed to make some sense of the close-up shown here (Figure 20), but would need an operator to work with it to understand it properly. Two things stand out here: the operator needed to explain the representation as a rule does not travel with it and secondly, the representation of only an interface is utterly unspectacular, so probably would not travel far in the first place.

Same control room photo, different readings

In addition to its own material, Rijkswaterstaat has allowed outside media professionals to photograph its control rooms, knowing that this material will also travel and represent Rijkswaterstaat. One such image—part of the collection of one of the major Dutch journalistic photo agencies (called Hollandse Hoogte)—is interesting

for its formal qualities, but above all for the different places where it has appeared. It was taken in the Nijmegen control room and shows an operator at the front console, the one with the clearest view of the intersection of the Waal, the main Dutch continuation of the Rhine, and the Maas-Waalkanaal, a canal that connects the Waal to the Maas. This is the control room discussed in the previous chapter, the one that had to stand out in the landscape.

Figure 22: A photo by Ton Poortvliet of an operator in the control room in Nijmegen. On the right, a smaller yellow ship passes by, which is a Rijkswaterstaat patrol vessel. Figure 23: The same photo is used on the website of the transport magazine Totaaltrans to accompany an article about the conflict between operators and management and the political consequences. Figure 24: Again the same photo used on a Rijkswaterstaat website for BICS.

Both the timing and the control of the depth of field show that this is a professional photograph. It takes a lot of patience to get so many ships at the intersection, and the inclusion of the patrol ship passing by is so perfect that it could have been staged. If the raw footage taken in Dordrecht is anything to go by, staging cannot be ruled out. It also takes a skilled photographer to stretch the depth of field to such an extent. The operator, the interfaces and the ships are all in focus, which is more difficult because of the different light intensities. That might have required some

post-production. With an inferior camera and inferior skills, I also tried to make this photo, but never succeeded.

Such a picture would have been useful to illustrate how many players are involved in traffic coordination, although not all are visible here. The dark screen on the left is the cargo database, IVS or its successor IVS Next. On the skipper's side, the complementary system is called BICS (Binnenvaart Informatie- en Communicatie Systeem), through which cargo and voyage details can be registered. The Rijkswaterstaat website for this system contains instructions for skippers and specifications for developers. There is a browser-based version of BICS and a standalone application that works offline without being dependent on other software. The latter can be downloaded from the website. The homepage of the website uses the photo of the Nijmegen control room. The website is available in several languages; the German caption for the photo is "Die Waal bei Nimwegen, gesehen von der Verkehrsleitzentrale aus:". The text is hyperlinked to the location of the control centre on Google Maps. When entering the Netherlands via the Rhine at Lobith, the Millingen sector operator, who is based in the Nijmegen control room, is the first representative of the state a skipper will meet. Prior to departure, a vessel with potentially dangerous cargo or of oversized dimensions must register via BICS. Jerry, the skipper of the container ship *Sunrise*, showed me the procedure before we left the Duisburg container terminal (Field note 29.3.17). The software that distributes the containers on the ship (Figure 25) exports the relevant data to the BICS software. Jerry added the data of the ship, journey, persons on board and the signage the cargo required (Figure 26). Due to the tank containers with chemicals—which require a minimal distance between them, complicating the distribution of weight—the *Sunrise* had to carry two blue cones (Figure 27). Upon entering sector Millingen, the transfer of this data between the Revierzentrale Duisburg, which covers the river until the German border town of Emmerich, is checked as the skipper calls in.

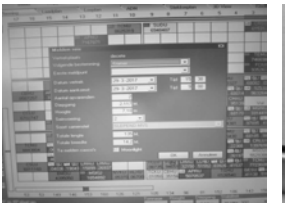
On board the *Liberty*, this automatic transfer had not taken place:

> "Post Millingen, the Liberty going down stream," Millingen answers with a mere "Post" and the operator says we aren't registered and asks for the registration number of the ship. (…) Rob gives the number routinely, the Post asks what our draught is, 2.6 Rob says. I asked who should have told him who we were. Rob says: "Germany, the Rivierzentrale, the operator will request the info there." (Field note 29.11.16)

Here the exchange of databases disappears behind the various operators Rob was talking to on the marine VHF radio. Rob seemed to think that the operators in the Dutch and German control rooms were in personal contact for each transfer, and the way I asked the question suggests that I was assuming something similar. We could think this because our cargo was grain, which does not require registration through

BICS. However, the international exchange of its data is automated, building on the tradition of transnational governance of the Rhine that dates back to the 19th century (see chapter one).

Figure 25: Using software called ContainerPlanner, Jerry organises the distribution of the containers (including future unloading). Figure 26: The data is exported to BICS via a form in which Jerry also enters the details of the voyage, draft, height, number of blue cones and people on board. In this and the previous figure, the true name of the ship is hidden. Figure 27: The blue cones are two steel objects placed at the stern to signal the dangerous cargo to other skippers.

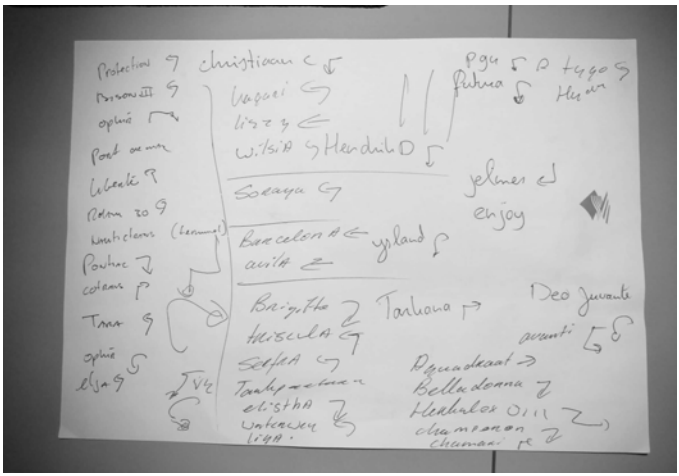

In the past, skippers used to report to the control room in Millingen, where the Rhine splits into the Waal and the Pannerdensch Kanaal, which connects to destinations further north. The direct view of this stretch of water was abandoned and several sectors were centralised in the new control room in Nijmegen. The old control room is still there—it is now used as a residence for artists. Generally, I noticed while on board of several ships that not all skippers had managed to keep track of the Rijkswaterstaat centralisation efforts and did not always know where the operator they were talking to over the frequency was located.

The placement of the photo of the Nijmegen control room on the BICS website, and the way in which it was done, locates the apparently placeless database. Although, of course, databases are located somewhere. Bert, the Duisburg operator, proudly showed me the server room, as skippers would show the engine room (Field note 19.4.17). However, it is precisely the screens that display the relevant interfaces that were not captured by the photographer. The choice of this photograph as a representation, and the way in which it is framed on the BICS website, therefore seems to be less about making the system transparent and more about representing a localised authority. It shows the skippers as the embodiment of that authority, the one who oversees them.

Another place where the same photo was used was in a report on the 2015 conflict between operators and Rijkswaterstaat on the website of a transport magazine (Figure 23). The headline translates as 'Minister denies unsafe waterways due to understaffing' and is about a response by the responsible minister to questions

in parliament, as discussed in the previous chapter. The article mentions that Rijkswaterstaat is structurally employing fewer operators for control rooms and crews for patrol vessels because "according to the minister, it has become clear that the same work can be done with fewer people" (TotaalTrans 2015). The justification is that the vessels are better equipped to make decisions independently, which, as we now know, has happened through the mobilisation of the control room perspective. This allows a different reading of the same photo: the operator may be looking at skippers who do not need him as much as they used to.

Figure 28: Notes taken by an operator in Nijmegen during his stint at a radar console. Several of these sheets are produced every two hours before the operators rotate to another sector or a more administrative desk to recover.



The general lack of control room representation, i.e. the operator's perspective and an insight into the actual work and not just the place where the work is taking place, is reinforced by this photo. It is a little easier to see what the screens are showing, but how they relate to the actual work remains rather vague. The binoculars to the left of the operator are not usually hung that low. At least when I was in this control room, or in any of the other control rooms I have visited where the binoculars hang from the ceiling in this way, I never saw them hanging so low. When not in use, they are out of the operator's line of sight. This suggests what Operator Sander, quoted in the field note above, said: to be positioned so prominently must be part of someone else's idea of operator work.

There is a clue to the specificity of operator work, but it is only visible to those already initiated. The operator is holding a piece of paper, and having zoomed in, I am

pretty sure it contains notes he takes while coordinating traffic, and probably looks something like Figure 28: Operators often keep track of the names of vessels and the directions in which they are heading, in order to be able to pass on this information quickly when a particular passage needs to be planned and arranged through concise communication. Remember that the marine VHF radio frequency is shared by all vessels in the sector and only allows one participant to speak at a time. The more people who share this acoustic space, the less room there is for each individual voice. In Nijmegen, for example, when a ship comes out of the locks of the Maas-Waalkanaal and calls in, it is offered an overview of the traffic, with the distances from the approaching ship to the crossing given in metres. The difficulty often lies in the names of the ships and their intentions. The interface provides the former, as the AIS data is labelled to match the display of the radar image on the chart, but not the latter. So the operators write down the names and add little arrows to refer to when providing an overview and suggesting passages, which can easily include five different vessels. The notes are kept in a drawer for a short time after each shift, in case they need to reconstruct a particular event and see if the operator has noticed all the relevant ships. As far as I know, this was done voluntarily. Such paper practices, quirky perhaps for work coupled so tightly to media technology, have long persisted in air traffic control too (cf. Potthast 2008). Again, all this is only visible to the initiated; I was only able to represent this practice because I had experience and other material to draw on.

3.2. Combining workplace studies and media studies to avoid their pitfalls

So far, we have moved from the larger tradition of infrastructure- and mobility-oriented control room representation to the inland navigation control rooms of Rijkswaterstaat. In this way, I have tried to illustrate how organisational legitimacy and authority are conveyed through control room representation, which usually obscures the operator's work itself. It was only through my knowledge of the work and my experience of representing the control room myself that the obfuscation could be given a more concrete dimension. This also allowed me to identify control room elements—in addition to the architecture discussed in the previous chapter—that are made for representation, not for the work itself: be it the large screen in the WSV Duisburg control room, the signposting in the KNMI weather room or the dashboard in the Prorail train dispatching centre in Rotterdam. The different readings of the same photograph are rooted in the different audiences that control rooms (are) designed to address. In previous chapters I have spoken of audiences, plural, not singular. Skippers are not usually addressed by the dominant regimes of representation. The only symbolic dimension they encounter is the architecture of control

rooms, otherwise they are confronted with operators directly, via marine VHF radio, or through regulatory protocols materialised in software interfaces.

This brings us to the literature on the visuality of control rooms. From a media perspective, there are two key texts, neither of which has the ambition to connect lived experience, organisational dynamics and representational regimes. They do not differentiate control room publics because they do not consider in detail who is being addressed. The omission of control room practice and the kaleidoscopic approach to control rooms to some extent reproduces some of the aims of representational regimes: to discuss that they are there, not what they do. The virtue of the kaleidoscopic approach is that it brings into view the many different manifestations of control rooms that permeate our society. Shannon Mattern (2015) takes an interface perspective, tracing the evolution of dashboards from hardware to software. These are important roots as they also bring the haptic dimension into view (cf. Plotnick 2017). She critically traces the trend to govern cities through data, represented in dashboards, also publicly through websites with real-time ambitions. Cormac Deane (2015) takes a more explicit media archaeological approach to the control room, focusing on military manifestations but also attempting to periodise ambitions and technological developments from 1939 to the present. What both authors show is that there is clearly a control room continuum between popular culture, imaginaries of technological control, political ambitions and "technological solutionism" (Morozov 2013).

I too have tried to show this in the opening pages of this chapter, albeit in a somewhat narrower way. However, I argue that more mundane, less famous representations—in local newspapers, through inaugurations, as a backdrop for broadcasting traffic information—tell us a great deal about control rooms in their local entanglements. I have tried to highlight some of the stories not covered by the representational accounts offered by Shannon and Deane. In the first chapter I have traced how an infrastructural need for centralised and mediated control emerged and where it manifested itself locally, a perspective enriched in the second chapter as a labour history. What is missing in Shannon and Deane, as in the otherwise rich studies of military control through technology (cf. De Landa 1991; Edwards 1996) and its later materialisation in drone warfare (cf. Gregory 2012; Väliaho 2014), is a bottom-up view of the actual work. The main exceptions come from Mainz, where Gabriele Schabacher's *Infrastruktur-Arbeit* (2022), her work with Sophie Spallinger (2023) and Tom Ullrich's work (2024) embody a new direction in media-infrastructure research.

The actual control room work has been captured aptly by a discourse on what Lucy Suchman has called "centers of coordination" (1997). In the 1990s there was a real coherence to these studies, captured by the emergence of workplace studies, but since then they have spread to other disciplines such as sociology and geography. What they all have in common is that they are rooted in sustained observation of practices and are reported ethnographically. Together, these studies pro-

vide valuable insights into human-computer interaction and cooperative work, the materialisation of the networked society, and the organisation of mobility. Scholars have looked at the practices of organising air traffic safely and efficiently (cf. Harper and Hughes 1992; Harper et al. 1997; Sanne 1999; Potthast 2007), airport logistics (cf. Suchman 1993, 1997; Potthast 2011), the metro (cf. Heath and Luff 1992; Filippi and Theureau 1993; Heath and Luff 2004), emergency dispatching (cf. Whalen and Zimmerman 1990), energy distribution (cf. Silvast and Virtanen 2014) and maritime navigation (cf. Hutchins 1995). In retrospect, they could be said to have examined the practical manifestations of the larger "promise of control" (Anderson and Gordon 2017). These studies included representations of the control room, which were used to explain in detail how operators worked. Therefore, we now know how control room work consists of mutual orientation—unearthing informal tactics like whistling to notify a fellow operator which task you are performing—and different forms of intense cooperation resulting in the "ongoing" (cf. Suchman 1997; Heath and Luff 2004) accomplishment of safety and mobility. This is much more than the execution of a schedule: often the updated schedule is more a representation of the work done (cf. Suchman 1995: 59) than of the work at hand. These studies were also visual in another aspect of their method, as it was propagated to the work of film operators in order to reconstruct the small steps taken to complete a task. In this way, scholars produced their own regime of representation, largely unaware of the political tradition of making the control room visible that media scholars have brought to light, and of the organisational dynamics of which these representations are also a part. Unwittingly, surely, by deeming it worthy of such prolonged study, these workplace studies contributed to the prestige of the control room.

3.3. Control room gatekeepers caught between prestige, concentration and resignation

As described above, the mediated presence of control rooms is an important reason why they are so widely known. However, the media professionals who produce these representations are only one of many visitors, perhaps the least frequent. For the remainder of this chapter, it is worth focusing on the gatekeeping practices of control room operators. The control room is moving away from the inaccessible place it once was: increasingly, control rooms have long been designed to welcome outsiders. To understand who is welcome, how they are let in, and how their presence is managed is to understand control rooms as double functioned. In this respect the second half of the chapter is indebted to work done by Regina Peldszus (2021), who has labelled this "dual use" in the context of space mission control centres.

I extend Peldszus's argument in two ways: First I pose that control rooms in a wide range of fields (large scale infrastructure, urban management and policing,

nature monitoring, space flight) combine the material organisation of complex procedures with contributing to the "overarching programmatic values of their operating organizations as establishments of international prestige, sophistication and capability." (Peldszus 2021: 285) Second, as also shown above, for nautical control rooms legitimacy and accountability are equally important programmatic values to pursue.

As detailed in chapter one, large infrastructural interventions such as dams have long been the primary instruments of legitimacy of the modern state, made visible through inauguration rituals, visitor centres and their sheer scale. In the older generation of control rooms studied here, the actual gatekeeping is still done by operators, and time and space for visitors are limited. In the newer control rooms, gatekeeping in its practical sense is largely taken away from the operators, while more space is made available for visitors. Through a series of ethnographic descriptions of control room visits and their set-up, I show how gatekeeping is done. The final case discussed is exceptional and contrasts with the previous ones: it shows what happens when a control room is no longer integrated into and aligned with state programmes of legitimacy and prestige. It has fewer resources to keep the gates open and takes the task less seriously, which has a detrimental effect on what I call the everyday 'concentration regime' maintained for coordination work.

Gatekeeping is increasingly about opening gates deliberately and frequently, rather than keeping them closed. Furthermore, I argue that gatekeeping in control rooms takes place in a threefold cycle: 1) someone has to grant you access, 2) someone has to open the door, 3) your presence has to be acknowledged and accepted. This approach also allows for the integration of the classic literature on gatekeeping (cf. Whyte [1943] 1993), in which gatekeeping is a metaphor, with actual sociomaterial practices of gatekeeping, i.e. physical boundaries that are designed to be technologically open and closed.

The three phases of gatekeeping

Of the three phases, the first and second are usually not performed by the same person. The first phase of gatekeeping is about permission, and the second is about actually opening the gates. The third phase is about social acceptance: people opening up, sharing their thoughts, past experiences, explaining what they are doing and why. This article focuses primarily on the phase in between, and how it reflects the organisational dynamics that govern the first phase and the issues of trust that govern the third.

One of the difficulties I encountered in my fieldwork was how legitimacy operated in different ways. What legitimised my presence in the control room for middle management made the control room operators suspicious. Organisationally, a basic interest in control room work confirmed the prestige so assiduously constructed

in the local and national press. Conversely, the operators were suspicious of anyone who aligned themselves with middle management and wanted to reproduce the narrative of high technological competence (see chapter two).

As mentioned in chapter one, the way in which Rijkswaterstaat's control rooms came to my attention was through a prime-time news programme on Dutch national television in 2015. In it, the operators stated that they were no longer in control. They were understaffed and, as a result, unqualified temporary staff were being placed behind the console. It was unusual for the operators to break rank. Rijkswaterstaat is a prestigious, originally military organisation. So in the early stages of my fieldwork in 2015, the management didn't want anything that went against their programmatic values to be reported. They treated me more like a journalist who wanted to uncover something quickly, unaware of the slow pace of academic publishing, whereas operators wanted to share their concerns with me and generally wanted a view from below, from the workplace, to be visible.

This shows 1) how the dual function of control rooms is interlinked, and 2) how it becomes visible in misaligned phases of gatekeeping. First, if the co-ordination work of the operators does not run smoothly, it cannot demonstrate capability and accountability, and thus provide legitimacy and prestige. Second, even if management chooses to give the command to open the gate (phase 1) and the operators comply (phase 2) mostly like none of them will open up to the visitor. Alternately, once I have been let in the control room without permission by management to encounter very frank operators. Yet I decided against the offer to let me in regularly without managements' knowledge or consent as I deemed endangering operators' job security unethical.

Not all ethnographic fieldwork takes place in places that are so clearly walled or enclosed, and so these three phases only apply to the study of organisations with clear spatial security regimes. In his classic study Street Corner Society ([1943] 1993), Whyte devotes an appendix to his relationship to the field, a Boston neighbourhood he called 'Cornerville', and to access in particular. "Cornerville was right in front of me and yet so far away," Whyte wrote (289). The control rooms I studied were not right in front of me, they were physically far away, on isolated patches of land near the intersections of major waterways whose traffic they coordinated. After a long struggle, Whyte finds a man called Doc who agrees to show him Cornerville (cf. 290–1). As explained above, one such person does not exist for my field, as it lacks the spatial and cultural unity of Cornerville. In particular, by focusing on the second phase, the operators who man the gate, gatekeeping is neither a metaphor nor a metonym. In the first stage it is a metaphor, where the permission of middle management ultimately opens the gate. In Whyte's case, Doc's vetting process is part of a classic metaphorical gatekeeping practice. It still requires Whyte as a stranger to declare his business, but there is no actual gate to open. After that, Doc is more a

guide than a gatekeeper: he shows Whyte places he did not know, introduces him to people he does not know. Thus gatekeeping moves from metaphor to metonym.

The story of gatekeeping at the control room door can be told in four episodes. The first is only briefly touched on here, it was when the political advisor and former control room manager Pete took me to the control room in Dordrecht for the first time and covers the basics. On a later chance visit during a night shift, I learnt that the control room operators also remotely controlled the main entrance when the receptionist left. In most of the Dutch control rooms I studied ethnographically, gatekeeping is done by an operator in 'recovery mode'. Only during night shifts, when there is less traffic, less staff and very few visitors, is radar duty and gatekeeping combined.

The second episode looks at the purpose of the control room door and how this has changed, leading to the third episode, which looks at the recent trend to explicitly design a control room for visitors, as in Maasbracht, described at the end of the previous chapter. In a fourth and final episode, I discuss the curious case of the neglected control room door.

Who gets in

Apart from that first visit to Pete, the operators always knew I was coming. The exact time was flexible, as long as I didn't come at shift change, when the operators are too busy to watch the door or greet me, suggesting the enforcement of a concentration regime. The range of people who passed through during my many visits to these control rooms can be divided into three categories. First, there were the routine visitors, who came most often and were integrated into the day-to-day work of the control room: cleaners, colleagues from patrol boats, technicians (usually external) for repairs and updates, and food suppliers. Then there were the organisational visitors, who were less predictable and less frequent: middle and senior management, political and technical advisors. The third group always came with someone from the second: external software developers for introductory visits and beta testing, internal guests, dignitaries, members of the (local) public.

When I visited the Nijmegen control room for the first time in 2016, Malik opened the door. Malik was the janitor and was busy mopping the floor when he saw me through the glass door and opened it. Malik had been contacted beforehand by e-mail, which had been sent by the middle manager who had granted me access, announcing my visit. The question for Malik was to register me on some software application.

About an hour into my visit I wrote the following:

> Someone is at the gate and Pete [an operator] blindly presses the button to open the door. Edwin [also an operator] responds: "You shouldn't do that, it could be Al

> Qaeda." Pete replies: "They're already here," and slaps Malik on the back. Everyone laughs. "Just kidding," says Pete. A little later, [operator] Hank, who is clearly younger than the others, says that there was a time when he would ring the doorbell of a Rijkswaterstaat building and always say: "Al Qaeda, coming to blow everything up!" This always resulted in the door actually being opened. (Field note 6.12.16)

In this case, the second and third phases of gatekeeping, opening the door and social acceptance, are closely linked. Those for whom the operator won't open the door, terrorists, and those whose presence he won't socially accept, people with migratory roots, are conflated, while the actual threat is met with absurdity. The control room is the domain of white, mostly middle-aged men.

I did not speak up to the racist operator and felt like a coward for doing so. On the one hand, I thought I was taking the field for what it is, for what it shows me, and not intervening, but on the other hand, I did not feel free to intervene because of the gatekeeping power of the operators. This is particularly true of the third phase of gatekeeping, social acceptance, and as a consequence of the first phase, access. I needed permission from middle management for every single visit to the control room, and negative feedback from the operators could reduce my chances.

The glass door through which Malik saw me was quite a departure from the heavy blind doors of the older control rooms. These control rooms were thought to be under great external threat, remember Filarski's Cold War story about the expensive concrete control room in Tiel in the previous chapter. The Nijmegen control room marks a shift in Dutch control room architecture and its visibility, which I will discuss in the next section.

Designing control room visits

Air traffic control (ATC) rooms are the most visible control rooms. Towering above all other airport buildings, they have become symbols of aviation infrastructure. Despite their commanding position, the critical plane of observation has long since shifted from their windows to the collection of interfaces. This interior has been depicted many times, including in popular culture, but a visit is unlikely.

By comparison, we have seen that the operators in the Dutch inland waterway control rooms make more use of the view through the windows onto the waterscape, partly as a result of their professional biography, having been trained in the wheelhouse. Situated more independently in the landscape, the recently completed buildings differ from the pragmatic concrete structures of the 1970s and 1980s in two important ways: 1) they have taken an aesthetic turn in both material and form, and 2) they have been built to better accommodate the visiting public. Both changes point to a paradigm shift: from security to transparency.

Publics have long been invited to admire control rooms as, deployed at the frontier of state and organisational legitimacy. The first nautical control rooms, built in Rotterdam, were intended "as an advertisement for this world-class port" (Halma 2004: 13) and inaugurated by a Dutch royal in 1956. Similarly, when the late Queen Juliana inaugurated the nuclear power station at Dodewaard in 1969, the photographs that appeared in the newspapers showed her at a console in the control room. In general, the shift in infrastructure away from construction and towards efficient use coincided with an increased interest in legitimacy with the local and national public. Here the double functioned control room fits right in.

The control rooms in Nijmegen and Maasbracht are not the only ones with an eye-catching design. The design of the newer Rotterdam Port Authority control room (completed in 2010) has a striking glass façade that appears to float in the air through a steel structure. The operator consoles are spaced so that there is plenty of space for visitors to walk around them, although a centralisation effort has significantly increased the number of consoles in a room. The Antwerp Port Authority had planned a new control room with a distinctive design, but the austerity policies of the post-2008 era led to it being cancelled, one of the operators told me when he gave me a tour in 2017. It sounded as if he had to explain the less representational state of his control room (Field note 7.4.17), which he did not consider suitable for visitors.

Regulating interaction with publics has been approached differently in mission control rooms, as Peldszus details. Glass panels have long been used to demarcate the dual function of control rooms more clearly and thus "promote transparency" (Peldszus 2021: 297) while protecting concentration regimes. In the case of the American space flight access for television audiences were even "facilitated by a public relations officer on an official console position inside the control room, thereby reassuring the Western public of US capabilities." (ibid.) Peldszus writes that in the 1970s a Soviet "control center was so small, aging and spartan that a visiting US delegation was certain that their Russian partners had shown them a fabricated facility, instead of what they believed must in fact be a secret underground bunker complex located elsewhere." (297–8) After this the Soviets believed they needed a "presentable" control room and created a new control room with "a selective access system that led visitors including foreign delegations, dignitaries and press through a separate entrance to a mezzanine with views onto the main screen." (298) The demarcation between the two control room functions was also made to meet demands by operators who "were wary of political officials observing them closely while working on critical tasks on the consoles." (ibid.) The aesthetic shift associated with the control room's promotion of programmatic values was also reflected in the installation of large central screens, but less so in the construction of eye-catching facades.

Compared to the nautical control rooms, secrecy is more prominent in Peldszus' field. Secrecy is pursued through the design of limited access, not by keeping the

gates closed. When it comes to the norm that the socio-material assemblage of operators and consoles should be state of the art, it is difficult to distinguish between the two functions of the control room. This is also linked to the assumption that maximum agency maximises prestige. By assuming that any console that was not state of the art was a fake, the US delegation assumed that the Soviets would prefer secrecy to prestige, since it was impossible for them to compromise on agency. Though aged consoles do not rule out agency, the Soviets went along with the double function logic and built themselves a new control room. Both in space flight and many other forms of mobility infrastructure, gatekeeping practices follow from the assumption there is something to show off.

But sometimes there isn't. The Duisburg case described at the beginning of this chapter shows how prestige and expectation can clash with the mundane. Germany has no ambitions to actively coordinate traffic, instead operators simply keep track of where ships say they are on the radio and make a database entry accordingly. One operator knew that his job was not prestigious and explained that new operators were usually WSV employees on permanent contracts who did not fit in elsewhere (Field note 19.4.17). Without prestige, they were not used to visitors. Getting in, the second stage in the gatekeeping cycle, meant calling the operator on duty on his mobile phone. They had no way of opening the gate remotely. There were many more WSV staff in their building, who could enter with a RIFD door chip.

Broken door (politics)

Looking at the photos I took of the entrances, I noticed that I often took them after leaving the control room and otherwise from a distance, without any of the details I mention here. This has a lot to do with the CCTV cameras at the gates, which force a one-way, mediated view: I did not want the first image they saw of me to be one with a camera. I was too busy trying to get in, trying to look like a normal visiting researcher, half relaxed, easygoing. But also: I made sure that I was identifiable and clearly stated my business. Once I had completed this stage, I needed my hands for my luggage while opening a heavy door, which was only unlocked for a short time and could not be photographed at the same time. The only one I photographed relaxedly was the one where no gatekeeping was performed, which was at the Terneuzen control room (also featuring in the prologue of this book).

I had heard stories about the Terneuzen control room from an operator who worked there: it was dramatically understaffed, morale was low. It would be difficult to get into that control room, I thought: why would they want a nosy researcher around? At least that was my experience of the Dordrecht control room, and I deduced that more controversy meant less access. The only contact I had in this region was a senior manager at Rijkswaterstaat, who had previously granted me access to another control room. She replied to my email by copying a local manager, who sim-

ply replied that I was welcome and that I should call before I arrived. So much for phase one.

Figure 29: Broken intercom at the Terneuzen control room.

Terneuzen is a town in a strip of Dutch land called Zeeland Flanders, which has no land connection with Belgium apart from a tunnel under the Western Scheldt—the estuary of the Scheldt that connects Antwerp to the North Sea. The region is struggling with depopulation and is not only geographically but also politically peripheral to the Netherlands. When I reached the gate shielding the control room premises, it was open, the intercom taped over with a piece of black garbage bag (Figure 31). The reinforced control room door had an intercom with a CCTV camera, but it was unlocked. The idea that something critical, prestigious and potentially vulnerable was taking place here, as suggested by the architecture, protocol and attitude of other Rijkswaterstaat control rooms, was absent. So the second phase of gatekeeping was virtually non-existent.

As for the third phase of gatekeeping: only afterwards did I realise that during my twelve hours in the control room no one ever asked me what I was doing. In other control rooms, I always had to declare my interest and my independence from management before anyone would talk to me. In those control rooms, not only was the entrance guarded, but the operators still had positions to defend within the larger

organisation. To complain is to signal a transgression of a norm, a deviation from the desired state. This has been the case in many control room industrial disputes, of which there have been many—most dramatically the air traffic controllers' strike (cf. Nordlund 1998; Vaughan 2021). Often, the conflicts can be traced back to privatisation, austerity policies or shortages of operators due to an ageing workforce. For these conflicts to be played out in public requires a strategy of public mobilisation, which the Terneuzen operators had abandoned.

The dual function of the control room—coordinating complex patterns of vessel movement and contributing to the prestige and legitimacy of the organisation and the state—was only half-heartedly achieved, if at all. The traffic situation was complex, as was the layout: amid strong tides and through narrow channels along sandbanks, ocean-going and inland vessels sailed at radically different speeds and followed different courses with contrasting manoeuvrability. I was still impressed by the ability of the operators to avoid dangerous situations. I had by now learnt to assess this somewhat, but the ability was not demonstrated in a performative way. The Dutch state, in the form of its most prestigious agency, Rijkswaterstaat, has little interest in taking public credit for this. It is important to note that the control rooms along the Western Scheldt ultimately serve a foreign port: Antwerp. Through a bilateral treaty, the Dutch state has committed itself to coordinating traffic on the water. The Terneuzen control room is therefore not so much a promise to the local public. It is further implied that prestige, legitimacy and accountability are only sought within national borders, as long as local publics carry clout.

The rubbish bag used on the broken gate at Terneuzen implied that someone was going to repair it at some point and protect it from further deterioration. The screening of the control room area may have been more to prevent it being turned into a public car park, which does not appear to have happened. Although the control room is visually present in Terneuzen, it is located on a separate pier. Perhaps this physical isolation, in a sparsely populated area in general, is what prevented random curious people from going up there when gatekeeping was literally abandoned.

Historicising gatekeeping, seeing control futures

Adrian Johns said that "the practices of gatekeeping—those of keeping gates open as well as those of shutting them—need to be historicized" (Edwards et al. 2011: 1418). This section does just that, with a few additional dimensions: 1) who is let in, 2) why, and 3) how is this reflected in a particular organisation of space, but also vice-versa? 4) how does the distribution of space invite particular gatekeeping practices?

The historical shift from security to transparency took place between the 1970s and the 2010s (which is not an absolute, but a shift in emphasis), but especially in the 2000s. The control rooms studied here have long sought legitimacy for their state organisation, both in terms of accountability and prestige. The historical shift

has played out in the following ways along the dimensions listed above, through the three phases of gatekeeping—gaining permission, opening the gate, social acceptance:

First, more and more members of the public were allowed direct access to the control rooms, whereas previously outside media and communications staff had been invited to record and distribute the work of the control rooms. Dignitaries were always brought into the control room as part of the process of gaining prestige and legitimacy through privileged networks. Such visitors went through all three phases, although invitations made the first less visible and authority made the third less important. Colleagues such as patrol boat crews did not need permission, they still relied on the operators to open the door, but social acceptance was easy as they were part of the same nautical culture.

Second, and by now well known, control rooms in general, and infrastructure control rooms in particular, became the primary place where organisational action was made visible, and thus instruments of representation. There was not much else to show, the age of dramatic intervention was over.

Thirdly, the resulting double function of the control room meant that operators had to regularly open the gates to outsiders, adding a performative element to their work. The expectation of regular visits requires a socio-material assemblage in which gate, operator and other control room work can be smoothly aligned. When prestige and legitimacy are not actively sought, no time is allocated for gatekeeping, nor are smooth gatekeeping assemblages organised, as the German case shows.

Fourthly, once the presence of visitors is more actively integrated into the design of the control room, the actual gatekeeping, phase two, becomes less and less a task of the operators and shifts to middle management. They see their role as both keeping the operators in check and giving tours, or, as in the case of the Maasbracht control room floor manager, they appoint another layer of management to do this. With the rise of these control room tours, the third phase of gatekeeping—social acceptance by operators—becomes largely irrelevant (and longer stays for ethnographers less likely). The key instrument in this constellation is the concentration regime. What is otherwise a primary gatekeeping motive for the first function of control rooms—coordinating and securing movement and stasis—now becomes an instrument for keeping operators in a performative mode, behind the glass windows if there are any.

This points to a deeper truth about many infrastructure control rooms, obscured by the prestige they seek: within infrastructure, they are the cheaper solution. But by that logic, control rooms, and especially the labour, eventually become too expensive. Decades of meticulous cost-cutting will then come knocking on the control room door. Centralisation of control rooms is one way to reduce costs, sharing the previously exclusive control room perspective with ordinary traffic participants is another. A third way, building the control room for what was originally a secondary

purpose—legitimacy and prestige—gives it a new lease of life. Pete, the policy advisor from chapter one who first let me into the Dordrecht control room, predicted that any further centralisation of nautical control rooms would be combined with the design of a visitor centre (Interview 8.6.15).

3.4. Conclusion

All this points to a deeper truth about many infrastructure control rooms, obscured by the prestige they seek: within the infrastructure, they are the cheaper solution. But by that same logic, control rooms, and especially labour, eventually become too expensive. Decades of meticulous cost-cutting would eventually come knocking on the control room door, which materialised in operators speaking out on national television in 2015. In the history of infrastructure, the first step was to move away from large physical assets and focus on more efficient use. The second step was further centralisation of control rooms, and sharing the previously exclusive control room perspective with ordinary traffic participants is a third. But there is a fourth: building the control room for what was originally a secondary purpose—legitimacy and prestige—and giving it a new lease of life. Pete, the policy advisor from chapter one who first let me into the Dordrecht control room, predicted that any further centralisation of nautical control rooms would be combined with the design of a visitor centre (Interview 8.6.15).

In this chapter, I have considered infrastructural control rooms and their relationship to publics constructed through representation and the reception of visitors. While control rooms have been built for an increasing number of domains, they have become less exclusive than their historical reputation would suggest, even though this reputation may be the very attraction of a visit. Control rooms operate in a different paradigm, one in which state authority is less obvious and public spending is under greater scrutiny. So they began to look different, with concrete replacing glass and their interiors optimised not only for operators but also for visitors. This also made them more expensive to build, but their purpose was multiplied, for example by including meeting rooms, which are more attractive in a chic location. In general, the transparent war room is also a post-Cold War trend, and it remains to be seen if and how the current level of openness will change now that we live in a multi-polar world with a renewed Russian threat.

The acoustic and visual dimensions need to be separated when designing the structural possibility of control room visits. We saw in the previous chapter how the kitchen in the control room in Dordrecht brought in other Rijkswaterstaat staff and disturbed the work acoustically. Until the end of the 1990s, control rooms were relatively small, and they were extended to accommodate more operators, as in Dordrecht, where the tasks expanded, prompting a renovation. In a newer generation

of nautical control rooms in Nijmegen and especially in Maasbracht and Rotterdam (Botlek), whether for traffic or locks, ceilings are higher, consoles are further apart and larger windows let in more daylight.

The approach to control rooms in media studies is one of a wide horizon, both synchronically and diachronically. At the same time, studies that actually had their own material from within the control room, briefly united under the umbrella of centres of coordination, hardly took the larger phenomenon into account. Deleuze's "societies of control" were never a concept there (1992). A third option is presented in this chapter, and in this book in general, by showing how the double function of control works in practice, which is more mundane and sometimes contradictory, as the circulation of the same photo in section 3.1 shows.

So far, the focus has been on how the control room was brought into circulation through visual representation, or how visitors were brought into the control room. In the next chapter, we will take a look at how operators bring the control room to local audiences, one screenshot at a time.

Chapter 4 – Tweeting operators

Figure 1: Screenshot of a tweet by operator Rolph, who calls himself "verkeersleider" in Dutch, someone who directs traffic. In this tweet from 13 February 2018 he writes: "Leisure ship mid fairway and with poor lighting! RWS71 underway." The RWS71 is a patrol vessel stationed on Devil's Island. Rolph has marked the ship which is approaching the intersection of the Oude Maas and the Dordtsche Kil with a red circle.

At times I was definitely guilty of hiding behind my note-taking in the field, not fully participating or observing because I was so preoccupied with creating a record. People in the field have commented on this time and again: it made them both suspicious and curious, and we usually ended up going through my notes together. Writing could be a way of dealing with my insecurity, but when I used my laptop it was also a way of participating in a field as permeated by screens and interfaces as inland navigation. Although the screen could also block my view, it seemed to be a way of not observing people too obviously. For a media scholar who later found his way into anthropology and ethnography, the screen seemed for a long time to be the sur-

face through which I studied the world. To speak with the dynamics of the field: in learning to see and listen like an operator or skipper—I clearly never became either, I just tried to understand how they observe their surroundings—I was more like the Rotterdam navy-radar-men-turned-operator than the inland navigation skippers-turned-operators. After learning about the existence of these control rooms, I was desperate to escape the confines of my office, tired of being a desktop scholar. Still, I struggled to get access to the field, so when I found out that the operators had started tweeting, I resorted to observing them online. At first it was clear that there was nothing ethnographic about it—the field was elsewhere.

To call this chapter a digital ethnography is a stretch. To say that my interactions with operators on Twitter amount to participant observation is also a stretch. Gradually, however, the various components of my research project began to bleed, adjacent spheres began to seep into one another. I realised that I was no longer just reading the tweets in search of a contrast to media archaeological studies of control rooms, which rely mainly on pop culture or the circulation by state actors, or to grasp Twitter's affordances and platform logic. Not only did I know several of the Rijkswaterstaat employees whose every tweet I read, but I also understood better which parts of their work they were showing. It became easier to read the screenshots they tweeted because I knew what larger context they were taken from (Figure 1). Conversely, as I found myself in control rooms more often, I realised that I could build on what I had learned from following operators online. In a sense, my control room interface literacy grew from both, though not in equal measure. Sitting next to operators for hours on end, and having them walk me through the capabilities and limitations of their various software applications during a lull, is unparalleled.

Without claiming that it was fieldwork, following the operators online felt like never really leaving the field entirely (cf. Abidin 2020). Although I was offline by default when working on my laptop, once a week I would follow the various accounts and take screenshots until I saw tweets I recognised from the previous session. As described in the first chapter, my interaction with operators via Twitter was tentative and remained so. This had to do with my own inhibitions, but also with the fact that I was getting to know other operators and skippers, mostly of an older generation, who prefer phone calls or text messages and are not on Twitter. Ironically, my real Twitter interactions with operators came when I was actually in the field. Just as they reported from their control room perspective, I tweeted what I had just witnessed, preferably in both text and pictures, just as the operators did. Perhaps writing it down makes it ethnographic again. At any rate, it is interspersed with other fieldwork experiences, both on board ships and in control rooms.

The operators' use of Twitter coincided with the 2015 conflict; not entirely prompted by it, but difficult to separate from it. This chapter analyses in great detail material that has never really been available before, and relates it to the actual work. The first section embeds the tweeting operators in the representational aspects of

how the 2015 conflict was broadcast. The second section analyses the tweets of control room operators in relation to how the organisation represented the workplace and what the work looked like during my fieldwork.

4.1. From broadcasting concerns to tweeting operators

As an intermediate step, we can briefly visit the television news and first compare it with how operators made their precarious situation visible to me during my first visit. I will then define the potential contrasting visibility that Twitter might offer and take a closer look at who I followed and whose tweets will be analysed in section 4.

Retired operator speaks

The item was aired in February 2015 by the NOS, the Dutch public broadcaster responsible for newscasts on radio and television. It begins with an overview of where these control rooms are located (Figure 2) and what they do. It says that "almost 200 Rijkswaterstaat operators help ships navigate the complicated and busy places. The position of the ships is determined by radar and the skippers receive instructions via marine VHF radio." (Parre and Hofs 2015) It is assumed that the general public, the millions of people who watch the prime-time news on a Sunday evening, do not know where these control rooms are and what they do, or at least need a reminder. The control rooms in Dordrecht, Tiel and Nijmegen are shown from the outside, and the latter accompanies the headline of the article on the much-read NOS website (Figure 3).

The item includes the operator's perspective by interviewing a recently retired operator—a wise move, according to a senior policy advisor, as public statements by employees against Rijkswaterstaat are not accepted and could have led to dismissal. This is where Rijkswaterstaat's hierarchical tradition meets its carefully controlled public image. In addition, operators are loyal to the organisation and it hurts them to speak out publicly against Rijkswaterstaat. Knowing this, the recordings made for this article in various control rooms, including Dordrecht, take on a different meaning. Although the operators initiated this report, they cannot do anything but sit at the console. They are not shown as they always are, in the sense that the camera position is not behind them, which would show the banks of screens more clearly, but one does not learn much about the work either. But on the banks of the Oude Maas, an oldtimer could speak for them:

> The retired operator: For example, if there's a major incident, then you're really short, then you miss things and then you just can't deal with it.

Journalist: Will that lead to dangerous situations?
Retired operator: It can certainly lead to unsafe situations.
(Parre and Hofs 2015)

Figure 2: Still from the NOS item on understaffed control rooms, with locations of control room as yellow dots, with the the Tiel control room in the background.

Figure 3: Screenshot from NOS website; the article version of the same item. The headline reads "Safety on rivers at risk". The photo of the Nijmegen control room is one taken by Rijkswaterstaat, and had to be taken not long before sunset because the light from the west makes the control room stand out. The flat Dutch landscape lends itself to such panoramic photo. Not much elevation is needed to make a control room stand out (in this case elevation is of course also a preventive measure for flooding).

Figure 4: Photograph taken in the Dordrecht control room of a filtered view of AIS information on a nautical chart of the south-west of the Netherlands which should depict the largely inactive Rijkswaterstaat fleet.

A trade unionist is then interviewed, who explains that the shortage of control room staff means that patrol vessel crews have to stand in for them, and that as a result some patrol vessels hardly ever sail. The journalist is then filmed in the port of Tiel, with the moored patrol boat in the background, as he explains that it sits there most days.

The operators would have had another way of making this visible, which they showed me in Dordrecht in 2015, during my first visit (Figure 4). On a screen with the Narcis application open, which displays the AIS labels of ships on a map, an operator selected only patrol vessels and no ships. Only one of the vessels was sailing, the others were moored, as indicated by the direction of their bows. The ships are shown as black triangles, with a black line indicating the direction in which the ship is moving. Except for one, none were parallel to a waterway. This is the kind of operator's perspective, a privileged view that usually does not extend beyond the control room. When I saw that several of them were active on Twitter at the same time, I wondered if this was what they would show.

What tweeting can do

In the aforementioned article, Lucy Suchman explained that she was in doubt whether "[m]aking work explicit, visible increases workers' vulnerability to rationalizing agendas," or if "[r]epresentations may become resources for workers' own

use in negotiations with management." (1995, 60) This was already the danger when Dirk van Zwijnenburg began to quantify his work in the 1980s. The data itself proved Zwijnenburg right and eventually contributed to better working conditions, but at the same time it legitimised a managerial way of representing work. That was an internal matter, but the use of Twitter goes further.

Much has been written about the promise and danger of Twitter (cf. Marres 2015; Weller et al. 2016; Tufekci 2017), not to mention the turmoil since it was bought, rebranded and even more radicalised in 2022. The promise of a bottom-up exchange of ideas and information, bypassing gatekeepers, contributed to the quantification of networked activity to prove this promise (cf. Passmann 2019). The honeymoon period did not last long, and as Twitter became more effectively used by actors with illiberal and destructive motives, the marriage between progressive politics and networked technology proved to be a sham. It is now commonplace to think that networked technology is not inherently emancipatory. This suggests that we should not expect too much from the operators of Twitter. Especially when you consider that the translation of interaction into metrics is right up the alley of Rijkswaterstaat, from the managers in the shipping department to the public relations officers in the corporate service. As Johannes Passmann has shown, the best way to understand this is through the tight coupling of circulation and infrastructure: "Twitter is not only a platform for the circulation of all kinds of messages; it is simultaneously an interface that makes this very activity explicitly visible. It is a highly reflexive infrastructure, as it automatically produces dynamic accounts of its infrastructural activity." (2019)

As detailed in the previous chapter, Rijkswaterstaat wanted to become more public-oriented with its reorganisation in the 2000s. This also meant that it wanted to be able to address those whose lives were most directly affected by Rijkswaterstaat's work. Through Twitter, Rijkswaterstaat can build more localised networks around specific "matters of concern" (Latour 2004: 4). Instead of, or in addition to, addressing the indiscriminate public, which is tied to the processes of legitimacy and accountability of the democratic nation-state, Rijkswaterstaat can now address targeted publics. In doing so, it can live up to its ambition to be less of a technical authority and more of an open partner. Moreover, by making much of the activity on Twitter "countable" (Passmann 2019), it is moving closer to the evidence-based paradigm that governs the managerialised organisation. No wonder that the Corporate Service actively encourages and structures the use of Twitter by operators.

The possibilities and dangers of making work visible, as Suchman pointed out, must therefore be considered both within the specifics of the medium used for this purpose and within the organisation in which this activity is embedded.

However, here too I am limited in my ability to consider the ongoing mutations of the platform, focusing instead on the practices of a very small group of users. However, there is some reason to believe that the operators' Twitter activity took

place on a relatively stabilised platform (cf. Passmann 2016, 2018, 2019). The most important change that occurred during the time I studied the tweeting operators may have been the change in November 2015 from favs to likes, no longer indicated by the star symbol, but by a heart symbol (Passmann 2018: 14). It materialised as part of a much longer process in which particular practices of giving and receiving gifts through retweeting and favouring/liking were adopted by Twitter (cf. Passmann 2018: 355–6). Although I did not begin systematically recording tweets until 2016, after this change had taken place, I began reading their tweets from the summer of 2015 onwards. There were other changes to the platform, though significant in themselves, such as the removal of the 140 character limit per tweet in 2017, which seemed to make little difference to the practices I observed. As will become clear shortly, tweets by operators often combine images and text, and Twitter has increased graphical capabilities in recent years, making it easier to include more than one image in a tweet. It is beyond the scope of this thesis and the scope of the dataset, although I am reluctantly using this work, to assess exactly how these changes are reflected in the tweets, how some practices preceded these changes, or how Twitter has changed as a result of either.

Who to follow?

I have never been present when an operator has tweeted, but we have discussed it, although not directly with Rolph. So on the one hand I rely on what they made public, but on the other hand I know many of the situations they make public. As mentioned in chapter one, I only explicitly followed operators on Twitter that I had met in the field. These are the operators Mark and Rolph, who happen to be the most active tweeting Rijkswaterstaat operators. Mark (Figure 5) worked in the Hansweert control room, which is located on the Western Scheldt where two fairways and the Zuid-Beveland Canal intersect. Rolph (Figure 6) still works in Dordrecht. The consequence of following them is that their tweets are displayed in my timeline, mixed with all the other people I follow, whereas I used a list provided by Rijswaterstaat to read the other tweeting operators and river masters. The advantage of the latter was that I could easily compare styles and see if certain information was circulating within the network through retweets. The focus of the rest of this chapter is on the tweets of Rolph and Mark.

Mark had been active on Twitter, at least with this official account, since June 2015. His handle is @VLW_Mark and his bio reads 'Regioverkeersleider bij Rijkswaterstaat op Verkeerscentrale aan de Western Scheldt', with contact details for the Rijkswaterstaat central office. His location is a link to the control room's location on Google Maps, which is also shown in the horizontally cropped aerial photo at the top of his profile and in the background of his profile photo. No other Rijkswaterstaat control room is as isolated in the landscape as the one in Hansweert.

Figure 5: Screenshot of the profile page of operator Mark, who works in the Hansweert control room along the Westerschelde, taken in September 2016. Figure 6: Screenshot of operator Rolph's profile page taken in May 2016. Rolph works at the Dordrecht control room and is seen by his colleagues as their spokesperson. On occasion he also works on a patrol vessel too.

The Western Scheldt must be the widest waterway where the wind is unobstructed, which I noticed as I cycled towards it on an early autumn morning in 2016. Mark is a keen photographer, so he may have taken the aerial photo himself with a drone—he regularly posts drone photos. He had brought his own tablet, on which he showed his colleagues photos he had taken over the weekend of a vintage car he owns, and showed me photos of strange or dangerous situations on

the water as seen from the control room (Field note 17.10.16). He had also tweeted some of them. In his profile photo he is wearing a Rijkswaterstaat windcheater. In his profile photo, Rolph appears to be wearing his Rijkswaterstaat buttoned shirt, which normally has epaulettes. Operators have long been provided with uniforms, which they generally seem to appreciate. Towards the end of my fieldwork, there was talk of this being reduced for financial reasons to staff who are directly visible to outsiders, such as lock and river masters and their crews.

Rolph registered his account around the same time as Mark, in August 2015. His handle is also similar, @VLW_Rolph. Operators are encouraged by Rijkswaterstaat's communication department (part of the Corporate Service) to use Twitter, and all operators and river masters have formal handles: function, then first name, separated by an underscore.

There are operators who tweet under a different type of handle and sometimes use their full name. Work is an important part of the content, but it is mixed with more personal content and hints at political beliefs, and sometimes participates in the general circulation of outrage, which is a prominent category on Twitter as on other social media platforms. Operators with official accounts largely refrain from this. They take a less outspoken role than one would expect from a civil servant. The private accounts are not included in Twitter's list of official accounts. However, the two types of accounts do exchange retweets and likes. You might expect the non-formalised accounts to contain more critical and outspoken tweets about work, but I have never seen anything resembling that. If anything, the formalised accounts, such as those of Mark and Rolph, do more to develop an alternative perspective on operator work than the private ones.

The horizontal image at the top of Rolph's profile page is a photograph of his main interface, with radar and AIS projected onto a chart. To the right is the triangular shape of Devil's Island and in the middle is the intersection of the Oude Maas, the Dordtsche Kil and the Krabbegeul. The white rectangular blocks surrounded by blue are ships, with small lines between them and their AIS labels—although these are made illegible by keeping the photo slightly out of focus. This tells you that it is a photo and not a screenshot—the former is taken by a separate device, in Rolph's case a smartphone, the latter is what used to be called 'print screen', a feature of most operating systems that allows the user to capture all or part of the interface on the fly.

Since I took the screenshots of the profile pages, they haven't changed except for the aesthetic changes Twitter made to the interface between 2016 and 2020. What has changed is the number of followers. For Mark, these had increased from 771 followers and 84 followers in 2016 to 1202 followers and 123 followers in 2020, while for Rolph they had increased from 777 followers and 214 followers in 2016 to 1805 followers and 330 followers in 2020. What has remained relatively stable is the ratio of followed accounts to followers. These are not exactly broadcasters—not in the sense

that this word has been used since the advent of radio and television. But they are mostly engaged in sending messages, not in playful exchanges.

4.2 Localising tweets

In what follows, I distil five years of reading and documenting hundreds of tweets into six themes, grouped into three categories: what the tweeting operators did most persistently, what was significant but less frequent, what might have been expected but was hardly tweeted about. It is not often that tweets can be attributed to just one theme, especially the first two, which form a continuum. In addition, some elements run through the Twitter activity I witnessed: the sharing of the operator's perspective through carefully curated photos of fragments of the control room setup, and the emphasis on shift work.

To anticipate the main findings, on Twitter, operators structurally share the control room perspective, allowing followers to gain visual literacy. To communicate control, non-events are the goal. The construction of near misses as a category therefore legitimises the work of the operator and thus the control room. It helps to escape the prevention paradox, in which the successful production of safety and mobility by the control room raises the question of why a control room is needed if nothing bad ever happens. This is done mainly through the circulation of images, for which smartphones are crucial devices between the control room console and the public infrastructure. It is shown that operators are not only involved in making work visible, but in the work of visibility itself. Furthermore, motifs from the long media history of the control room are observed to resurface, suggesting a continuity rather than a radically new position of making control room (work) public. The degree to which operators are aligned with organisational interests can also be explained by the surveillance work of the communications department of the Corporate Service. Although the infrastructure is made public through Twitter and the platform allows for the infrastructuring of the public, it has not been deeply integrated into the daily and mundane organisation of (safe) mobility.

Persistent

Protecting the public by maintaining order

In the first of the two themes common to most operator tweets, operators show their embodied control room perspective to demonstrate the kinds of situations they monitor, preferably without these situations ever becoming events, as the control room promises 'non-events'. Followers can gain a visual literacy of control room interfaces and a sense of infrastructure layout and use, and in turn a constellation of media that makes this visible, specific, local, can be deduced. However, in order

to fully understand the tweets, a certain amount of local shipping knowledge is required, so one of the audiences addressed is made up of nautical professionals. Particular attention is paid to the notion of near misses, as their documentation is used to fill the representational vacuum left by consistent safety without incident.

What stands out in general is that Mark and Rolph tweet a lot of images, as do their colleagues on the patrol vessels and skippers. Twitter has long been text-based, and significant Twitter networks develop around the appreciation of textual manifestations of wit and irony that provoke an exchange of likes and retweets (cf. Passmann 2018).

Mark regularly tweets photos of his main interface, in which radar and AIS are superimposed on a nautical map (Figure 7). Because of the repetition, one begins to see the opening for the Zuid-Beveland Kanaal at the top of the image and the 180-degree turn marked by the dotted lines and the lighter blue area in the middle of the image, which no ship ever crosses. It is difficult to determine when and how I learned to identify the various elements in this image, as I used a high-resolution map of the waterways in the Netherlands throughout my fieldwork, visited several control rooms along the Western Scheldt, and sailed the same stretch on board a tanker, the *Porter*. Nevertheless, I am confident that my visual control room literacy is largely based on seeing this kind of tweet and others that complement it. The Hansweert control room is on the right pier of the opening, as shown in the aerial photo on Mark's profile page. The lighter area is a sandbank and the dotted lines indicate the fairway. The white shapes on a blue surface are the ships, with a white line indicating the direction they are heading. Those on the (lower) right are heading east, south-east to Antwerp, those on the left west, south-west to either Ghent via Terneuzen, the port of Vlissingen or the North Sea.

Figure 7: Screenshot of tweet by operator Mark from 2016 showing his integrated interface of radar, AIS and digital chart. Figure 8: Another tweet by Mark, from 2019, which is liked by the author, as the red heart indicates.

In this tweet from October 2016, Mark writes: "Nice evening shift, still quite a few ships at the door #hansweert @binnenvaart @varendoejesamen". What he does here, and in many similar tweets, is indicate that he is keeping an eye on things without explaining exactly what is happening or showing any particular event. He adds the rather small town of Hansweert, outside of which his control room is located and named after. By prefacing it with a hashtag, he is indexing the tweet and linking it to all other possible tweets with the same hashtag, which cannot be too many, given how small the town is. He mentions two accounts; the first, @binnenvaart, is linked to a website called binnenvaartlog.nl, which collects inland navigation news from other specialised publications. The site seems to be run by a hobbyist, there are no advertisements. Updates on this website are automatically tweeted. It is unlikely to be retweeted by @binnenvaart, which has a few thousand followers. It is mainly aimed at professional skippers. The @varendoejesamen is part of the "Varen doe je samen" campaign, which is funded by the main stakeholders in inland navigation, from industry to government agencies, including Rijkswaterstaat. It translates as "Sailing is done together" and aims to inform non-professional waterway users through public events, the provision of educational material and a navigation app it has developed. The account @varendoejesamen is an enthusiastic retweeter of Rijkswaterstaat's nautical tweets.

Mark (and Rolph even more so) often mentions which shift he is working. In a tweet from June 2019, he writes: "A nice quiet day shift @varendoejesamen" (Figure 7). The shift itself is often not the main topic communicated, but including this information so frequently makes control room work explicitly shift work and implies a physical element to the work that is never communicated about control rooms. The length of shifts, the intensity of shifts, including the possibility of downtime during a shift, the individual sequence of shifts from early to late, and a guaranteed minimum number of days between a night shift and an early shift have all been contested over four decades of control room work. So when something that is so central to the work, and so contested, and yet remained invisible for so long, is made structurally present, it is a significant change.

In other tweets, about cycling or jogging, Mark and Rolph also make fitness an issue. Although I have never seen them tweet about food or eating, I know from being in the control room that it is an issue: operators sit still all day and know that drinking too much coffee with cake or biscuits on the side is a trap. I used to bring both when I was in the control room, which was to some extent expected and certainly appreciated, but operators were careful not to indulge. In this respect, control rooms are not very different from wheelhouses: here, too, skippers were conscious of gaining weight and eating unhealthily while sitting in a chair most of the time.

The same tweet from Mark was accompanied by a photo taken from the control room, with the piers on either side of the mouth of the Zuid-Beveland Kanaal just visible on the left and right (Figure 8). Two barges can be seen entering the mouth of

the canal, and a seagoing container ship and a barge are on their way to Antwerp via the Western Scheldt. Again, there is no particular event to report or announcement to make. Anderson and Gordon (2017) write about the promise of control and "non-events", based on Gordon's fieldwork in motorway control rooms. The idea is that "[c]ontrol is precisely what is placed in question, disturbed, by events." (2017: 160) So for Mark, reporting a non-event means that he is in control. In that tweet, there is a lot going on in Hansweert, on his doorstep, but it does not yet become an event.

Figure 9: Screenshot of a 2018 tweet by operator Mark, again liked by the author. A sailing regatta took place on the Westerschelde. Two Rijkswaterstaat patrol vessels, the RWS 78 and 79 were involved in the coordination. Figure 10: Operator Mark finds the convergence of traffic right in front of the Hansweert control room somewhat uncanny.

Most events are reported after the fact. In a tweet from late October 2018, Mark writes about an extraordinary amount of traffic during a sailing regatta in the past tense: "everything went well" (Figure 9). Only after he has established a visual norm of the normal amount of traffic over the course of many tweets does he really show how much traffic there is. He also thanks his "colleagues on the RWS 78 and RWS 79 @Rijkswaterstaaat for the extra assistance", indicating it was outside the bandwidth of traffic he can control himself. For those in the know, for those who follow Mark long enough, the sailing regatta tweet can also be a spectacle. On a more ordinary day, it can also be busy, but requires a trained eye and some framing by Mark, as in his September 2016 tweet (Figure 10). This shows roughly the same section of his interface. "Sometimes it just looks like magnetism," he writes, which matches what he said when I was there and it suddenly became busy on the water: "They sometimes say that a giant magnet was buried here." (Field note 17.10.16) It is likely that it is not just the amount of traffic that makes Mark say this, but the intersecting ships: two ships are heading for the mouth of the channel, while three ships are heading west. The two ships come in before the three, which has to be agreed by VHF radio between all the ships involved, which are travelling at very different speeds. On the

Western Scheldt, a seagoing vessel can travel twice as fast as an inland vessel. In this situation, there seems to be a large seagoing vessel involved, sailing in the middle of the fairway.

Figure 11: A 2018 screenshot of a tweet from operator Rolph, reporting on a collision between two tankers. Figure 12: Operator Rolph tweeting an image of the P2000 emergency system. Figure 13: Here, in another tweet from 2016 Rolph uses the hashtag #VTS, the international abbreviation for nautical control rooms, and writes about the increase in traffic due to low water.

Rolph also reports on events after the fact, but combines this with more variety in what he makes visible of the control room setup. Visually, he combines interface details explicitly tied to the circumstances with the kind of zoomed-out images familiar from non-operator representations of the control room. In November 2018, he tweets (Figure 11):

> Night shift 3/3. Handing over the watch took a bit longer due to a collision between two tankers #NieuweMerwede. Luckily no wounded. Both ships docked in #Werkendam. Investigation by @POL_zeehaven and @ILT_scheepvaart, @OVDW_Peter and RWS71 on site.

Rolph is doing his final of three night shifts. The use of hashtags in combination with geographical locations—the river where the incident took place, the Nieuwe Merwede, south of Dordrecht, which is not covered by either the CCTCV network of the control room or the radar network—indexes the tweet along with all the other tweets referring to the same hashtag, which, as with #Hansweert, cannot be many, but perhaps clusters the tweets about the incident. He mentions the accounts of the port police and the state inspector of shipping (who investigates every nautical incident) and ends with his colleague Peter on the patrol boat RWS71. The large screen is hanging at the desk where such incidents are managed, which otherwise is less intense and used to recuperate. The nautical map does not depict the river where the incident took place nor the harbour where the ships are now, but instead the double intersection that the Dordrecht control room monitors.

In May 2019, Rolph writes that the RWS73 pulled a drowning person out of the water "super fast", a person who "capsized with a canoe", adding the location: "#HollandschDiep" (Figure 12). In the picture below, the text on the display reads "vessel capsized". By reporting the event after the fact and linking it to a successful intervention, it demonstrates that even when things are not normal, these authorities can restore normalcy and the safety that comes with it. However, by depicting the distress call as being displayed in the control room, it implies that the RWS73 patrol vessel was sent there by the operators, and is consistent with the way in which vessels are centrally directed and operate in a reactionary manner with the advent of the control room. However, it is unclear whether the control room was involved in directing this intervention. In the collision between the two tankers (Figure 11), the idea of the control room as the place from which events are monitored, as the centre of coordination, is also implied by the map Rolph tweets, the summary he is able to give, and the various actors he mentions. As for the capsized canoe (Figure 12): the Hollandsch Diep, where this took place, is a waterway beyond their radar or CCTV coverage and the patrol vessels are also hooked up to the P2000 system.

This is a one-way mobile communication system whose messages are received by all government emergency services, including on pager-like mobile devices. It has three levels of priority ("Prio"), with 1 being the highest. The system is unencrypted and there are many amateurs monitoring it, for example by automatically forwarding it via Twitter. After the 112 centres switched to a digitally encrypted frequency, hobbyists were no longer able or allowed to listen in with VHF scanners. It seems like the P2000 system became an alternative system to monitor. Only once did I see Rolph directly retweet such a P2000 message, which made me realise that he also follows such amateur relay accounts, even though they have such a display in the control room for all to see. This could mean that 1) he follows these events when he is not working, 2) he may be a hobbyist or a professional with a sense of duty that outweighs his time on the clock, but 3) it at least suggests an online continuum between hobbyists and professionals.

Rolph tweets more photos of CCTV monitors (Figure 13). In general, the Dordrecht control room relies much more on CCTV than the Hansweert control room. The Western Scheldt estuary provides an open horizon, whereas in Dordrecht all the buildings on the riverbanks, the winding rivers and the large railway bridge spanning the Oude Maas interrupt a direct field of view. In October 2016, there is a lot of activity due to the low water level of the rivers, which is "very noticeable". There are six ships in the fairway, two are moored to the left. For those familiar with Dordrecht and its waterways, it is clear that this is seen from the railway bridge over the Oude Maas, with the eastern tip of Devil's Island visible in the top centre of the photo. The two larger of the six ships, lying behind each other, are waiting for the bridge to open. The first, with the red deck, is a seagoing vessel (higher bow), the second is an inland waterway container ship with a raised wheelhouse to see over the containers

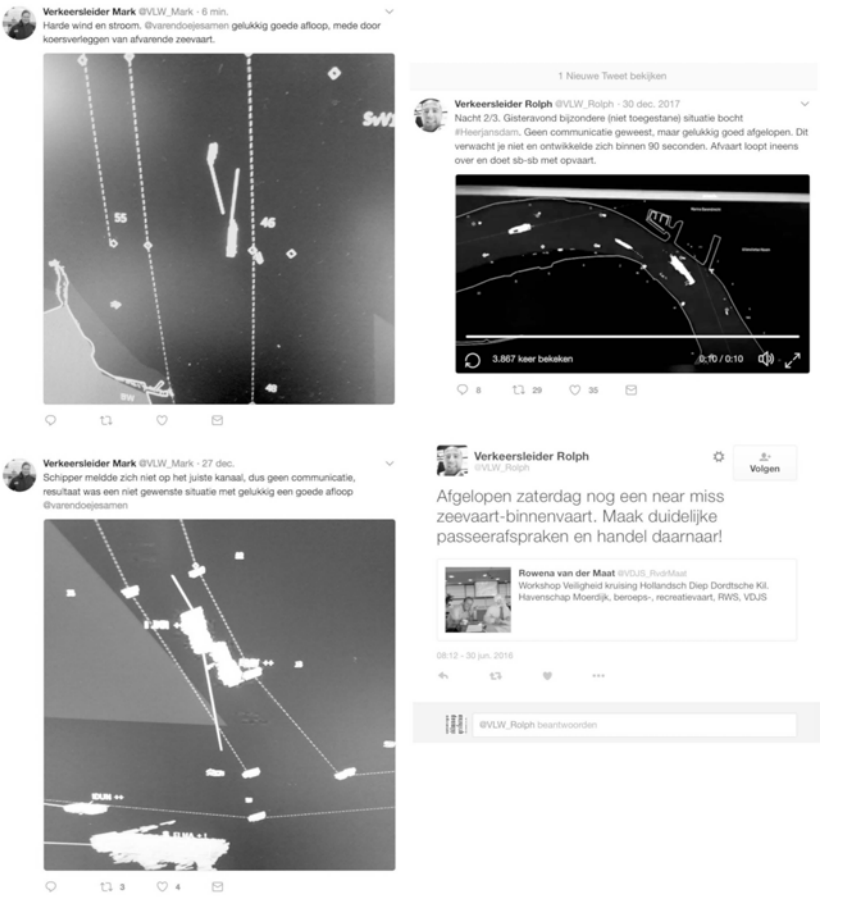
it is carrying. Both are so high that even at low tide, when the distance between the water surface and the bridge floor increases, they still need a bridge opening. The three ships on the right are all sailing, as indicated by the wake of white water directly behind them. They are on course to pass the bridge through a part that does not open. The bridge does not open very often because of the heavy train traffic between the north-west and south-west of the Netherlands, so it is likely that there are ships on the other side waiting for a scheduled opening. With these ships, who lie waiting on the other side, the three we see that are about to pass the bridge need to pass starboard-starboard, which requires extra attention.

So to understand how busy Rolph and his colleagues are, you need at least a sense of traffic at off-peak times, which you can get by following Rolph on Twitter over a longer period of time. But more than counting the number of ships, to more fully appreciate the particular situation, local shipping knowledge is implied.

As a shortcut, both Rolph and Mark zoom in on the situations they see, making it unnecessary to read the overall situation, unnecessary to connect the representation with the local infrastructural configuration. For example, Mark tweets, "Strong wind and current. (…) luckily it ended well in part because the sea vessel going downstream altered course," and adds a photo of two white shapes on a blue background relatively close (Figure 3.40). Identifying these as ships is not difficult, and you will quickly learn that the direction of travel is indicated by a white line extending from the bow, and that dotted lines mark the fairway. Also, sea ships are usually larger, so the smaller ship should be the one changing course. The smaller ship should be more to starboard, so that is the one drifting to port. So far it is quite simple. You could take it a bit further: being pushed to port here means that the wind is coming from the left, and possibly the current. The wind usually comes from the sea, west, southwest, especially strong winds. As the Western Scheldt meanders from east to west and the ship is being pushed to the east, also by the current, this could mean that it is high tide. The ship is tied to the waterway, as we learned in chapter two when the Dordrecht operator and the pilot of the *Jaroslaw* got into an argument. This means that in this situation there is not much room left for the vessel to move further to port. However, it is not necessary to infer this much from the photo Mark tweeted to make the picture understandable.

The detailed photos of interfaces—the reflection of light on the screen tells you it is not a screenshot—report on dangerous situations. The example above, where the circumstances may not exonerate the skippers involved, but at least mitigate their responsibility, is an exception. Most of the time, Mark and Rolph report situations caused mainly by human error. Sometimes these can be explained. For example, a skipper may be on the wrong frequency or otherwise unavailable to communicate (Figures 15 and 16), making coordination impossible and an early warning ineffective.

Figure 14: Operator Mark (top left) writes about how the wind and current brought two ships dangerously close. Figure 15: Here, (bottom left) operator Mark mentions that a skipper was not available on the right frequency, "with luckily a good outcome". Figure 16: In a 2018 tweet (bottom right) operator Rolph includes a clip of a dangerous situation on the Oude Maas, which "luckily ended well". Figure 17: Rolph (directly below) uses the term "near miss" in a quote tweet.



These types of situations are the most eventful non-events. There was no accident, nobody was injured, but it was risky. In the field, there is a special category for this, called a near miss. A slightly confusing term, as it actually implies a hit. Near collision would make more sense, but this is what stuck, and is studied in aviation (cf. Thoroman et al. 2018), railway (though mostly called 'running a red light' or 'signals passed at danger', cf. Taylor and Lucas 1991), sea shipping (cf. Zhang et al.

2016; Westeren and Ellerbroek 2017). In the maritime world, which overlaps with inland navigation in ports such as Rotterdam and Antwerp, near misses are registered as incidents and evaluated by authorities. The International Maritime Organisation (IMO) defines them as a

> sequence of events and/or conditions that could have resulted in loss. This loss was prevented only by a fortuitous break in the chain of events and/or conditions. The potential loss could be human injury, environmental damage, or negative business impact (e.g. repair or replacement costs, scheduling delays, contract violations, loss of reputation). (IMO 2008)

The element of luck is literally present in all the tweets (Figures 14 to 17); the claim that the operators prevented an accident is rarely made.

Rolph explicitly uses this term on Twitter (Figure 17), Mark does not, but it was used in almost every control room I visited. It makes describable what would otherwise disappear because there was no accident. It is a crucial concept for control room accountability, both internally and externally. In a way, it legitimises the control room without the need for an accident. The promise of control through the pursuit of the non-event, if successful, leaves a vacuum. This is similar to the concept of the "prevention paradox" as it has re-emerged during the pandemic. Originally an epidemiological concept from 1981 (Rose) to describe the contradiction between individual and population prevention strategies in medicine, it has been used differently in the popular discourse on Covid-19 prevention. It was "used to describe the apparent paradox of people questioning measures to prevent the spread of the pandemic because the predicted spread did not occur", according to the then recently edited Wikipedia page (2020). In the case of the inland navigation control room, its necessity was indirectly questioned in the way the minister justified the reduction of the control room staff, as discussed in the previous chapter. The actors involved in setting up the control rooms in the 1970s and the official documents mention unsafe situations as the volume of traffic increased. The absence of serious incidents since then could be attributed to control room coordination, or the absence could be attributed to something else (increasingly well-equipped control rooms) and used to question the very legitimacy of control rooms.

This view is shared by some of the skippers I have met. Rob, skipper of the *Liberty*, for example, made the comparison with German waterways, where crossings are not coordinated, and he thought things were fine (Field note 29.11.16). In comparison, Germany has many fewer crossings and not as much traffic. Some stretches along its main waterway are hazardous, and there it does intervene, more stringently than the Dutch state. On a seven-kilometre stretch of the Middle Rhine, between Oberwesel and Sankt Goar, traffic is controlled by traffic lights. Since the 18th century, various state-funded bodies have been active on this stretch of the

Rhine—see the *Wahrschautürme*, discussed in the first chapter. Today, the Oberwesel Revierzentrale uses a land-based radar network and marine VHF radio to centrally control five signalling systems to regulate traffic through a series of bends with shallow water and strong currents, where steep rock formations hamper radio communication between vessels (Figure 18).

Figure 18: Photo of two ships navigating a dangerous stretch of the Mittelrhein, taken from the Liberty in November 2016, looking upstream. On the right bank, the three horizontal lights indicate that no vessels are coming downstream.

At the time the control rooms were built in the Netherlands, it was expected that the increase in speed and size of ships and the growth of the fleet would not be possible without them. This is not exactly a prophecy, yet it is productive here to look at the self-defeating prophecies. Unlike self-fulfilling prophecies, the accuracy of the prediction has a preventive effect:

> a self-defeating outcome invariably involves a degree of voluntariness and some aware actions, as the result of a correct understanding, by the actors, of those causal mechanisms that are at work in the production of predicted effects. In fact, the prediction failure is a consequence of the renewed intentions of the subjects, who modify certain aspects of their behavior in response to the new awareness, preventing the predicted future state from happening (…). This new awareness is caused by the prediction itself and is related to its validity: if the subjects had

> not been familiar with the prediction, it would not have been undermined—that is precisely why the prophecy was initially true (Sabetta 2019: 55–6).

A self-defeating prophecy is therefore positive in itself. The fact that the growth of inland navigation has not led to an increase in accidents reflects positively on the primary preventive measure taken by Rijkswaterstaat: the control rooms. However, it could also appear that the operators are being left empty-handed.

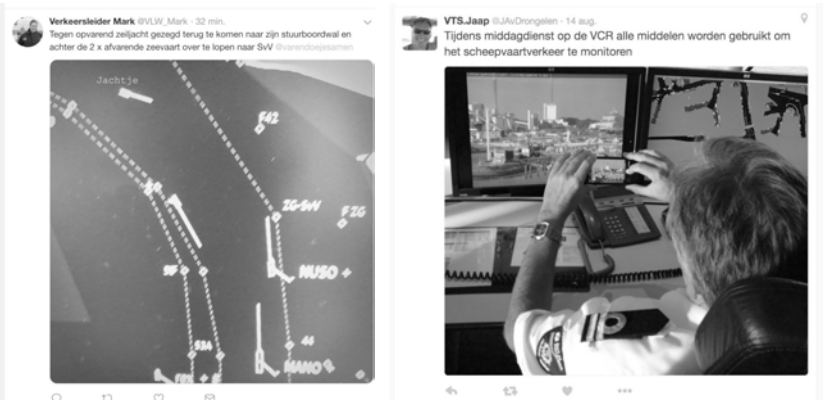
Educating recreational skippers by showing the control room perspective

In this theme these near misses play a prominent role too: they are used to educate and warn leisure skippers. However, it is not hard to see that they are also communicating that local order is being maintained, again by showing specific screenshots from their main control room interface. This also points to the prominence of the visual and the absence of the acoustic dimension that is otherwise so dominant in everyday control room work. This is explained not only by the crucial private role played by operators' smartphones, but also by the fact that, in addition to making work visible, operators are also engaged in visibility work, which primarily serves organisational interests.

Rolph also translates the term into Dutch, a "bijna aanvaring" appears in his tweet from August 2017 (Figure 19). At the intersection of the Dordtsche Kil and the Oude Maas, a seagoing vessel and a pleasure boat almost collided. In his interface, the direction of the ships is not shown by a line from their bow, but by an animation of their last route. So the small boat that crosses the red dotted line is heading west, downstream on the Oude Maas, just ahead of the seagoing vessel that Rolph explains is "heading for the Krabbegeul". This is a double right turn, almost 180 degrees. What is a red dotted line in this tweet is a white dotted line in an older tweet by Rolph, from September 2016 (Figure 20). After mentioning that he started his second of three late shifts early, Rolph gives an explicit warning, followed by an order: "The leading lights are meant for sea shipping! Keep starboard side #VTS". These lines indicate the deepest part of the shipping lane and is indicated on digital nautical maps, which apparently the leisure ship is following. In the original Dutch, the command includes an abbreviation for starboard side, suggesting at least some nautical knowledge on the part of the recreational boaters being addressed. However, it could also be the practice of brevity allowed by the limited number of characters per tweet in 2016, although he is on the safe side of the 1400-character limit with 107 characters in this tweet. In another tweet from August 2016 (Figure 21), Rolph also uses a commanding tone: "Keep to starboard as much as possible and look over your shoulder often." But more than just a command, combined with the careful selection from his vast interface, it also becomes quite dramatic, showing Rolph's narrative skills. One can see how the skipper on the leisure yacht might feel like he is the only one on the river, ignorant of what is creeping up behind him.

Figure19. Screenshot of a 2017 tweet by operator Rolph about a "bijna #aanvaring" (near miss) at the intersection directly in front of the Dordrecht control room. Figure 20: Rolph tweets in 2016 about a late shift where a recreational skipper failed to keep to the starboard side, which he has circled in red. Figure 21: Rolph warns leisure skippers to keep to starboard and look over their shoulder in a 2016 tweet.

Figure 22: Tweet from 2019 by operator Mark about a yacht crossing too close, which was warned on his instigation through the seagoing vessel's horn. Figure 23: Also in 2019 Mark writes that he told a little yacht ("jachtje") to wait for downstream traffic before crossing the shipping lane.



Sometimes, in their tweets about a narrow escape, the operators describe what they did to prevent an accident. For Mark, the seagoing vessels and the leisure yachts form the two ends of the speed spectrum, with the former being the fastest and the latter the slowest. In and around Dordrecht, sea ships take it easier and regularly need tugging boats to manoeuvre. In July 2019, Mark tweeted (Figure 22) about a yacht that "passes too close to a seagoing vessel and is unavailable on marine VHF

radio" At high tide, yachts are not restricted to the shipping lane, as seagoing vessels always are, so the small vessel in the centre of the photo could be heading that way. Recreational yachts are not required to listen to the local frequency, and although they often have marine VHF radios, they often do not know which frequency to tune to. Rolph's commands may also be due to poor communication with them: he may not be able to give them commands over the marine VHF. Also, pleasure craft are not required to transmit an AIS signal, as the vessels in Rolph's tweets and in this tweet from Mark are not doing, as indicated by the absence of a label with an abbreviation of their name. The ship does have a label, but Mark made it illegible for this photo.

He continues to write that he "asked the sea ship to give an audible signal, after which the yacht quickly altered course." As much as these Twitter practices bring to light previously hidden visual elements of the control room, the acoustic dimension of both the control room and the traffic remains absent. Here, Mark invites the reader to imagine this dimension: a yacht dwarfed by the seagoing vessel, unlikely not to have noticed it, yet not in contact with the seagoing vessel either directly or via the control room, and apparently unaware of how the seagoing vessel is moving. The yacht is absent from the shared acoustic space that is the marine VHF radio. The ship's horn is a shortcut, now it becomes clear that the yacht and the ship do share an acoustic space.

It is exceptional when a tweet gives a concrete idea of what the operator said when he intervened. In April 2019, Mark tweeted (Figure 23): "Told upstream sailing yacht to come back to starboard and cross to SvV behind 2 seagoing vessels going downstream. @varendoejesamen". It took me a while before I figured out what 'SvV' stands for, which suggests I am not local enough to be targeted by Mark, or that following Mark on Twitter is an invitation to become more local. SvV stands for Schaar van Valkenisse, a 'schaar' is a tidal channel, and this one is available for navigation by non-seagoing vessels. The two seagoing vessels are coming from the bottom right, off centre. Both have an AIS label, the yacht has a label for this tweet. In yellow it says "jachtje", little yacht. The different speeds are again alluded to: the yacht has to let the ships pass, even though the yacht is closer to the dotted line—the boundary of the shipping lane, behind which the tidal channel lies—than the two ships.

The contours of an acoustic representational vacuum have become apparent in the screenshots of the tweets discussed here. Given how prominent the acoustic dimension is in everyday control room work, its absence is striking. The core task of the operators is to monitor the traffic, inform the skippers of the situation and agree complex passing arrangements with all the vessels involved—the latter two tasks being carried out via marine VHF radio. The combination of keeping an eye on all relevant movements and translating them into concise messages over the frequency is central to the training, as far as I have been able to observe. Skilled operators are masterful at withholding distracting information, and using phrasing and tone alone to get a skipper to agree to a particular movement.

The absence of the acoustic dimension in the control room work made visible has its roots in different parts. There is the simple restriction of not being allowed to include ship names. As can be seen in many of the figures used in this section, ship names are not allowed in the photographs. Dutch law prohibits operators from making this public, generally for privacy reasons, and in the case of near misses, operators, as representatives of the state, cannot publicly accuse skippers of irresponsible behaviour. Omitting this from an audio recording is more laborious and quickly results in something less intelligible.

Figure 24: Screenshot of a 2016 tweet from Jaap, whom I met during the simulator training in Hoek van Holland. The control rooms of the port of Rotterdam are known to be better funded and therefore better equipped. From the stories he told I take it he sailed before, either at sea or on the Rotterdam waterways. As explained in chapter two, most Rotterdam operators have a background as radar operators on a sea ship. In the cohort Jaap was training, in which future Rijkswaterstaat and Port of Rotterdam operators are mixed, the two men destined for the port had been in the navy.

Telling a story without the names of ships is still easily done visually, and the role of the smartphone in the habitual media assemblage of shipping culture makes this possible. Everyone now carries a smartphone, so much so that its ubiquity has obscured its impact. For operators, having an additional, relatively independent and adaptable device lying around changes the dynamics and reach of the assemblages they are able to forge with other actors. The ad hoc recording of work situations has its practical advantages, also internally. An operator of the Nijmegen control room showed me two pictures on his smartphone, one of his interface, where a ship was turning right in front of the control room from the river onto the channel southwards, the next a photo of his view taken directly after the first with no ship visible at all. It was a ghost ship (Field note 6.12.15). It emphasised the need to be able to look outside, and in that sense the issue of direct view on the water was mobilised for the enduring struggle of operators as discussed in chapter two, but more mundanely, these photos were immediately forwarded to the developer of the radar software. To capture the bug convincingly, a third position between console and operator was advantageous.

Jaap, then an operator in the port of Rotterdam, tweeted a picture of himself taking a photo (Figure 24). The 2016 tweet is accompanied by the text: "During day shift at the Rotterdam traffic centre all means are used to monitor shipping traffic." The photo is likely staged, with someone being asked to take a photo of him taking a photo of a CCTV monitor. It seems to justify the presence of private mobile devices, a topic not without contention, as will become clear in the next chapter.

The radar and AIS data, as well as the interaction with the ship's VHF radio, are constantly recorded, but the visually based material allows for much quicker reuse. From behind their consoles, operators can quickly rewind to see a particular situation again, even if they want to tweet about it. Only twice have I seen operators in Tiel rewinding an audio recording:

> Upon arrival I see how Adrien [a former operator, now nautical advisor] and Niels [operator] listening to a tape one floor below the control room. There was a collision at six o'clock. A moored ship floated onto the waterway after a cable broke. An approaching skipper was warned, but it still went wrong. Niels comes up first, Adrien later, he gives his version of events, only informally he says he does not want to get involved and will give evidence later. (Field note 4.11.16)

This was an exceptional situation. The other time, an operator needed an instant playback because he did not hear or recall the name of a ship (Field note 6.12.16). Marine VHF radios also allow this, but only at the speed at which it was recorded so that it remains intelligible, as opposed to the rewind, scroll and fast-forward that visual interfaces allow.

Twitter itself is part of the answer: through established practices and design, it is much better at distributing visual material than audio recordings. In general, apart from the popularity of podcasts as a denser acoustic form, and the small-scale, more direct exchange of audio messages through services like WhatsApp, visual material is more widely distributed through networked devices—see, for example, Instagram, TikTok or YouTube (though often audiovisually, visually dominant, rarely just audio).

This brings us to a more fundamental point. The Twitter activity of Rijkswaterstaat's control room operators, and also of Rijkswaterstaat's patrol boat crews, is not exclusively used to represent their work. It is also a kind of work in itself, the work of making things visible. Here, the communications department of Rijkswaterstaat comes in, part of the Corporate Dienst. Of course, the communications department produces material that promotes Rijkswaterstaat work—it has its own drone team for instance to capture large infrastructural work—and plugs this at traditional news media. Yet, since it self-identifies as network manager and wants to connect to local infrastructure publics, who better to mobilise than those doing the infrastructuring?

Over the past few decades, large publicly funded organisations have expanded their communications departments while the budget for what used to be the core activity of the organisation has diminished. Universities are certainly no exception. Rijkswaterstaat used to build and maintain infrastructure. As its focus shifted to the use of infrastructure, it became more concerned with public perception and could not rely solely on the authority of engineering expertise. With the rise of the manager and the focus on cutting costs, the control room, which had initially been a model of behavioural change, was also identified as expensive. While skippers are increasingly able to navigate without the assistance of the control room or patrol boats, these Rijkswaterstaat crews have been given a new task: to manage relations with a variety of publics and to ensure that Rijkswaterstaat's side of the story prevails. They are perfect for this job, because they are one of the few people still out there who are not tied to a desk in a generic office building. They have something to show.

To this end, there are training days for Rijkswaterstaat employees who are active on Twitter. Best practices are shared (Figure 25), marketing gurus give talks (Figure 26) and Twitter activity is quantitatively evaluated (Figure 27). The communications department has a dashboard to monitor the Twitter activity of Rijkswaterstaat employees (Figure 28). The employees are aware that they are being monitored. Mark once received a call that his tweet was inappropriate and deleted it—he refused to say what it was about—and was completely fine with it (Field note 17.10.16). Operators are now the ones being watched by someone else who keeps an overview preventively. The communication department has partly moved from addressing the public to monitoring those who do so.

This explains the other two categories and the way in which they appeared.

Figure 25: Operator Jos, who mainly works on a patrol vessel, in this 2017 tweet (top left) mentions the annual Twitter meeting and the "do's and dont's [sic]" participants were told about. Figure 26: Top right: Cor Hospes—"content marketing & storytelling strategist"—writes he gave a talk at the 2016 Rijkswaterstaat Twitter meeting. Figure 27: A tweet from Jos on the 2016 Twitter meeting, which included a tour of the Dordrecht control room. Figure 28: Photo (bottom right) of the Rijkswaterstaat "Dashboard" as tweeted by road inspector Wilco in 2016. He writes: "here on the big screen all tweets are gathered."

Significant but less frequent

Symbolic legitimacy

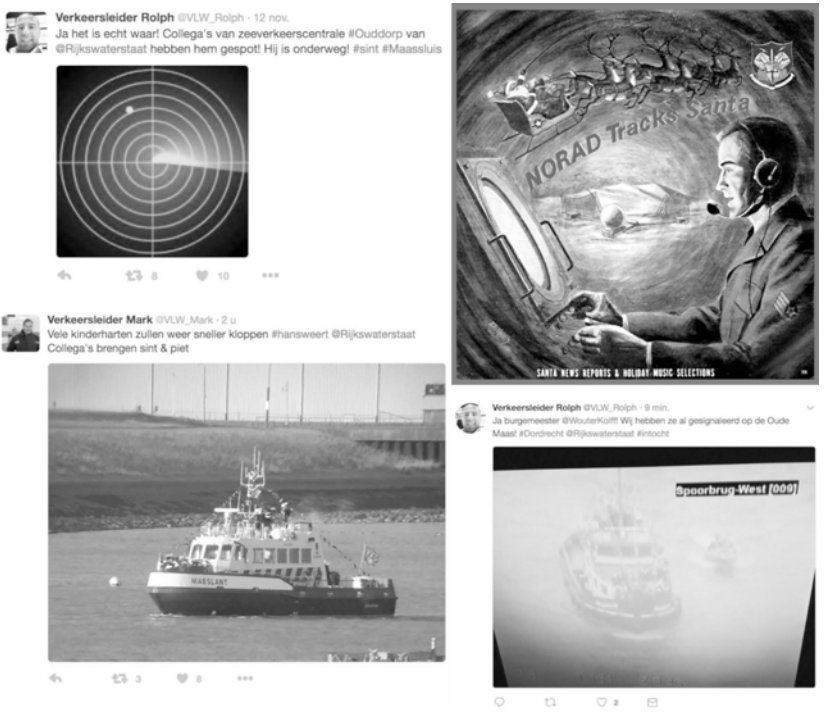
Public legitimacy and popular culture, I argue, form the outer ends of a continuum that influences how infrastructure work is done. Thus, this continuum is not merely symbolic, but is made up of practices that not only affect the work, but are an important part of the (control room) work (in this case). This then extends Suchman's aforementioned idea that organisations are made up of representations of work beyond spreadsheets, schedules and annual reports, widely recognised representational genres for organisations. Whenever one looks beyond these genres, things become more elusive. Control room work exists outside the realm of control room representation, which is a century-old tradition. In the vast and chaotic circulation of references, it is hard to pin down exactly how it works. But there are times when you catch a reference for the second and third time. This requires persistent study, and in the case I am about to present, over a decade of scholarly interest in the history of mediated control comes together. This is not to say that history repeats itself; it is not a matter of looking through the right lens and catching the same phenomenon in its orbit at the right time. It's about how things are reused, how some efforts in media history and popular culture are persistent and yet different.

In late November 2015, Rolph tweeted a fairly typical representation of a ship's radar: concentric circles, a radio beam, and a located ship as a fluorescent green dot (Figure 29). The tweet reads: "Yes, it's really true! Colleagues from @Rijkswaterstaat VTS centre #Ouddorp have spotted him! He is on his way! #sint #Maassluis". To understand the significance of this tweet and other similar tweets (Figures 31 and 32), two traditions need to be introduced: the Dutch holiday of St Nicholas and the way in which the US military interfered with the related North American tradition of Santa Claus.

The Dutch St Nicholas holiday, Sinterklaas in Dutch or simply Sint, is celebrated on 5 December. One of the main events in this tradition is his arrival by ship in the third week of November with his helpers, all called Piet—until recently called Zwarte Piet, Black Pete, and played by black-faced people. Sint is dressed as a bishop, a tradition that dates back to Nicholas of Myra, a bishop in Asia Minor in the 4th century. Nowadays the story goes that he comes from Spain and travels to the Netherlands to bring gifts to children who have behaved well. When he arrives, the children put out their shoes with carrots for his horse and are rewarded with small gifts in the run-up to 5 December. At night, a neighbour usually knocks on the door, runs away and leaves a basket of presents, implying that Sint and Piet have left them there. In terms of cultural significance, the whole tradition dwarfs Santa Claus in the Netherlands, and the gifts placed under the Christmas tree are far from ordinary. As early as September, shops start selling all sorts of Sinterklaas-related items, along with a whole range of traditional sweets and pastries. There is a daily children's Sinterklaas

programme on public television and his arrival is a live event. Each year one city is chosen to host the event, which attracts huge crowds, but in reality he arrives everywhere: every city stages its own arrival, every school is visited by someone dressed as Sinterklaas.

Figure 29: 2016 tweet (top left) from Rolph, claiming to have spotted and tracked Sinterklaas. Figure 30: To the right: sleeve of promotional record celebrating the 10th anniversary of NORAD Tracks Santa in 1964. Figure 31: Tweet by operator Mark (bottom left) from 2016, including a photo of Sinterklaas on board of a Rijkswaterstaat ship. Figure 32: In 2017 (bottom right) Rolph reported on the arrival of Sinterklaas in Dordrecht.



Since 1955, "NORAD Tracks Santa" has been the US Air Force's annual public relations event (Figure 30). NORAD is the main control room for the US Air Force, the one from which it would direct a nuclear war, and the one that is hacked by a teenager in WARGAMES (Figure 11, chapter two). The idea is to keep children up to date with Santa's journey from the North Pole. Since 1981, children have been able to call in to find out where Santa is at any given moment, a service that relies on volunteers.

Control rooms are actively inserted in such cherished actions of collective make-belief through their reputation for early detection and tracking. It shows parents that these very serious places, of course the NORAD control room in the Cold War much more so, can also be playful; it shows children that there is a place that monitors things and therefore knows exactly, not the 'soon' or 'near' estimates that their parents deal in. It gives credibility to both the story and the control room itself.

The important difference between NORAD tracking Santa and Rolph and Mark tracking Sinterklaas is the scale on which they operate. NORAD patrols an airspace that spans a continent, it has to convince a nation that there is a powerful place that is always on guard, it has to legitimise a government as vigilant and capable. Rolph and Mark are control room operators, monitoring nearby waterway crossings from their respective control rooms, trying to convince local residents that there is not just a place, but someone keeping an eye on things, thus legitimising Rijkswaterstaat on the ground. In his first tweet (Figure 29), Rolph has no choice but to add a fictitious radar image: he claims that Sint is still at sea, which he cannot see from his control room, but from his colleagues in the maritime control room in Ouddorp, whom he invokes. In later tweets (Figures 31 and 32), he and Mark report on a local arrival and can rely on direct sight (Mark) and CCTV (Rolph). In Mark's case, Sint and his P are actually transported by a Rijkswaterstaat patrol boat. Rolph informs the mayor of Dordrecht that they have "already detected" Sint and his crew on the Oude Maas. Because the arrival is actually staged, they can report on it with their images, which are indexical, unlike how NORAD has to represent how it tracks Santa Claus.

There is no grand design here. I am sceptical about Rolph and Mark's knowledge of the NORAD tradition. Of course, it could have been initiated and co-ordinated by the Corporate Service people. What recurs here is the quest for legitimacy by aligning the control room with cultural phenomena with deeper roots. It shows that control rooms are concretely and actively engaged with popular culture and tradition, and not just imagined in films, TV series and video games.

Affective and spectacular

These tweets about Sinterklaas also fit in the larger theme of affective and spectacular tweets prominent in Rolph and Mark's tweets, as in the tweets of their colleagues (who as a matter of fact also join in on Twitter when tracking Sinterklaas). These come in roughly three different forms: tweets about accidents, sunsets and oversized ships.

The first category tends to be covered by river masters (Figure 33), or mobile traffic operators as they are now called. This includes saving a drowning person or recovering remains (Figure 34). They do not report this in a sensationalist way and seem to suffer from this type of work. Control room operators are more involved in coordinating the preceding search. Here, the tension associated with the deployment of different emergency teams and the time-critical task is clearly affective (Figure 35).

Figure 33: Operator Jos posts a photo of a sinking barge on the Dordtsche Kil in 2018, with a Rijkswaterstaat patrol vessel in the background. Figure 34: Again Jos, now a tweet from 2019. A photo of a member of his crew on land, collecting remains under a bridge where a fatal collision between a person and a train took place.

Figure 35: Operator Rolph's 2016 tweet about the emergency response after a car crashed into the river.

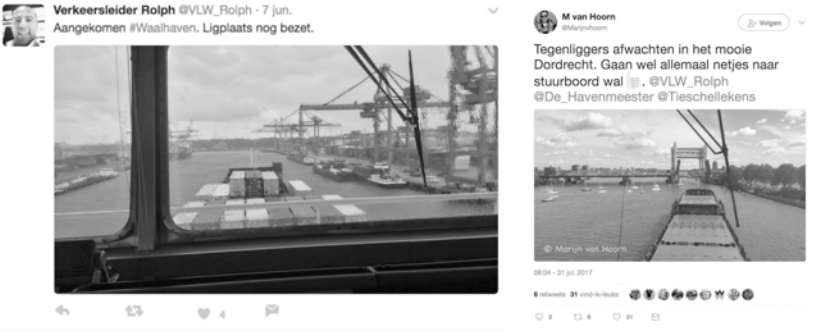
Figure 36: Tweet from operator Mark from 2016 (top left), photo taken from the Hansweert control room. Figure 37: Sunset as seen from the Dordrecht control room (top right) shared by operator Rolph in 2016. Figure 38: Bottom left: a special transport enters the mouth of the canal in front of the Hansweert control room, as photographed and tweeted by Mark in 2018. Figure 39: In a 2016 tweet Rolph announces the departure of a large seagoing vessel (bottom right, bottom tweet) and then shows it is moving.

Clearly, these tweets are a continuation of the local public safety and public order concerns discussed above. Sunsets, by comparison, are completely mundane, but still provide the kind of affective content that circulates well. Mark and Rolph often relate this to the fact that they are working a late shift (Figures 36 and 37).

Large seagoing vessels are a more frequent sight for Mark than for Rolph. The rivers around Dordrecht are regularly navigated by large ships, but they need much more assistance. For Mark, it is the special transports of unusual items that stand out, such as the columns of an oil rig (Figure 38)—he expresses his admiration for the craftsmanship required for such transports. Rolph often gives updates on the progress of special transports and oversized ships through his sector (Figure 39), actively inviting his followers to see events from his perspective. He skilfully combines the spectacular with the non-spectacular, emphasising the involvement of the con-

trol room and the patrol ship and, like Mark, praising the craftsmanship of the crews and pilots. I have never observed any hostility towards the latter, either on Twitter or in the control room. Rolph tweeted about a working visit on board a container ship sailing through the port of Rotterdam (Figure 40). A local pilot on board a large vessel praised the behaviour of the recreational skippers and mentioned Rolph (Figure 41), adding that it was a good example of coordination between different authorities.

Figure 40: Rolph aboard of a seagoing vessel in the container terminal of the port of Rotterdam, as tweeted in 2017. Figure 41: Rotterdam pilot, Marijn van Hoorn, is about to sail through the opening of the railway bridge of Dordrecht, as tweeted in 2017.



Expected but rarely encountered

There were three themes that I expected to find, but hardly did: criticism, time-critical information and interaction with people from outside Rijkswaterstaat. With regard to the first, especially in the early days when the conflict between operators and management was still close to the surface and the patrol vessels remained largely moored, I somehow expected to find references to this situation in the tweets. As for the second, the potential speed of distribution on Twitter through retweets (and likes) could be used to reach many actors in a relatively short period of time, which would be useful in the event of a disaster. The third theme, the ease with which Twitter allows conversations between geographically and socio-economically dispersed people, would have been a great opportunity for operators to interact while sitting behind the reinforced door of the control room.

Criticism

If Twitter had been my only source, I would never have noticed that something was amiss between operators and management. Perhaps I was naive, perhaps I had bought into the emancipatory narrative of social media. On the other hand,

there are accounts like @lokfuehrer_tim, a German freight train driver who has been tweeting about his travails in the rail infrastructure since 2011. The picture that emerges is one of shift work, but also of an erratic infrastructure, with considerable insight into (mis)communication with dispatchers, disruptions and delays. However, I am not aware of any such sovereign accounts by train dispatchers. And although there are quite a few barge captains active on Twitter, none share the same employer as @lokfuehrer_tim does with Deutsche Bahn dispatchers. And although @lokfuehrer_tim travels along the Middle Rhine right on the riverbank, the skippers he sees are more independent users of the infrastructure, often self-employed and owning their own vessel.

The near absence of tweets critical of Rijkswaterstaat, and the way this contrasts with the stories operators told me while I was in the control room, has many likely causes. Among them are: 1) the careful policing of how Rijkswaterstaat is perceived publicly, including through the monitoring of those who represent the organisation; 2) loyalty to the organisation, going back to its military roots; 3) the type of operator who is attracted to Twitter in an official capacity, and possibly the type of operator who is recruited by the communications department (both Rolph and Mark did not speak critically of Rijkswaterstaat to me during the shifts we spent together in the control room); 4) in the case of the Dordrecht control room, the successful move to the new control room, and with the harshest austerity policy behind them, there is less discontent among operators.

Figure 42: In 2016, operator Mark retweets a tweet from Sander Wels, a retired operator.
Figure 43: In 2018, Mark retweets a tweet from Cees Barth, who worked on a Rijkswaterstaat patrol vessel at the time, but has since deleted his account.

Having said that, there are two retweets of tweets by Mark that are critical and worth mentioning here. One is a tweet by Sander Wels (Figure 42), which reads "The #Waal is not a playground, but a #main-transport-axis for #shipping. Awareness of

this requires knowledge". The photo shows a jet ski and a kayak behind a push boat, the largest vessel navigating the Waal and Rhine. In the second (Figure 43), Mark retweeted something written by Cees Barth, who at the time worked for Rijkswaterstaat on a patrol vessel but, like Wels, used a private account. Barth was commenting on a news report about the shooting of beavers, which had been reintroduced in the 1980s and were now causing too much damage. Barth comments: "Quickly cleaning up the mess of a decadent hobby." Taken together, these retweeted tweets reveal a thoroughly modern understanding of rivers, as discussed in the first chapter: they should be singular entities. This understanding is juxtaposed with a practice that is messy, hybrid. The tweets in this chapter treat rivers as waterways, which makes sense, as operators focus primarily on traffic and often address other waterway users. Here, however, the modern concept of water as separate from land, which enabled the regulation of the Rhine and other major rivers, seeps through. Rivers are for transport, nature is infrastructure. The beaver, in particular, disrupts this: it lives on both land and water, blurring the boundary between the two.

Time-critical information

In retrospect, the few time-critical tweets logically follow from professional inland navigation skippers, who are rarely addressed directly via Twitter. There is another forum for exchange that skippers are obliged to use: marine VHF radio. While Twitter allows Rijkswaterstaat to map a more dispersed control room public, the regulation of inland navigation has made skippers permanently accountable. Skippers are present on Twitter and also in operators' tweets, but mostly through likes, when they approve of the way others—recreational boaters, people living near waterways—are informed about inland navigation. At times skippers also provide content of hazardous altercations with leisure skippers.

When skippers are addressed directly, the time-critical information relates to their mobility or what is hindering it. For example, Mark reports fog conditions (Figure 44) or the current wave height during a storm (Figure 45). This information is also relevant for recreational skippers and both are explicitly addressed by mentioning the accounts @binnenvaart and @varendoejesamen. However, as will be discussed in more detail in the next chapter, inland navigation skippers have more reason to fear waves on the Western Scheldt than recreational skippers. As a rule, the yachts on the estuary are seaworthy, whereas inland waterway vessels are not built for open water, especially when they are heavily loaded.

In Rolph's case, it is noticeable that the tweets directed at professional skippers are less likely to be accompanied by pictures. This points to the urgency of the message, assuming that skippers need not be entertained by affective material, nor be introduced to an otherwise easily overlooked infrastructure as they already live this infrastructure. Although the skippers I have spent time with do not know much about the control rooms themselves.

Figure 44: Operator Mark tweets about dense fog locally, but better conditions downstream in 2016. Figure 45: Here Mark tweets what appears to be a screenshot of the wave height during a storm in 2016. Figure 46: Example of a tweet from operator Rolph (bottom right) in 2016 about a technical problem with a bridge in the port of Rotterdam, operated by Rijkswaterstaat.

As Tobias Röhl (2019) points out, the reduced capacity or even breakdown of infrastructure is often an interesting moment, as this is often communicated and in turn elicits a reaction from the public, explaining expectations and norms. Rolph writes about a crucial bridge in the Rotterdam port is "still not being operated" and that Rijswaterstaat is doing everything in its power to solve the problem (Figure 46). Although Rolph implies that even if it does break down, users of the infrastructure might expect it to be resolved sooner, this did not elicit any complaints in response to this tweet.

Interaction

As we have seen throughout this chapter, tweets tend to have more retweets and likes than replies. In future projects, I would like to explore this dimension further, as I have automatically tracked the Twitter activity of many accounts over the past four years. This would tell us more about the allegiances of operators through retweet networks and allow me to map how their tweets circulate. But as a preliminary remark, it can be said that infrastructure publics on Twitter and infrastructuring publics with Twitter is done through a type of narrowcasting (cf. Metzger 2017), with far more followers than those the operators follow themselves. Sometimes interaction is encouraged, but more in a planned way, like radio jockeys asking listeners to contribute. For example, when Rolph shared his sleep strategy for the

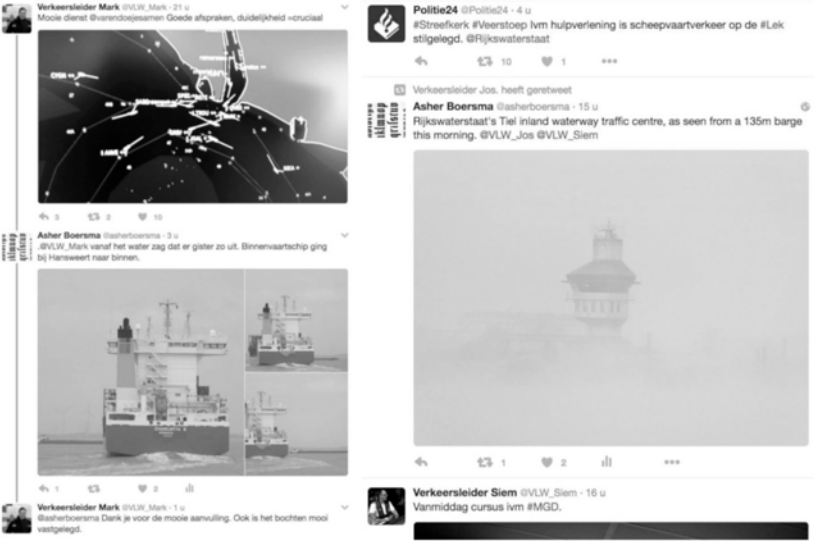
night shift (Figure 47), asking "What's your ritual? Curious to hear!" Here, a range of shift workers, from skippers and truck drivers to fellow operators, responded with different strategies for different rhythms. The interaction between operators and their followers is reciprocal: when a question is asked, operators respond, but people do not seem to follow these accounts for controversy or witty back-and-forth. It could also be explained by the asymmetrically distributed agency in the matter of shared concern: the operator has all the relevant information needed to ensure safe traffic centralised in the control room, not his followers. The ongoing reproduction of safety and mobility by operators and skippers takes place elsewhere, as we will see in the next chapter.

Figure 47: 2019 Tweet from operator Rolph, who is starting his second of three night shifts, having slept a few hours in advance. He asks his followers how they cope with a similar challenge.

As for my own interaction with operators on Twitter (Figures 48 and 49), I was mainly trying to share what I was learning with the operators I knew. That I had other knowledge to add to the interface knowledge that I had built up through Twitter and fieldwork in the control room. As a skipper turned operator, they had advised

me to learn what it was like to navigate rivers. I was aware that by interacting with them I was becoming visible to the communications department of Rijkswaterstaat. Senior ethnographers had advised me to avoid this department, as they might want to have a say in where and when I visited the control rooms. In my dealings with other Dutch government agencies, I learned that the communications department would indeed take on an additional gatekeeper position. As mentioned in the first chapter, I also reported to my academic community and made sure that anyone interested in my work would be captivated by my fieldwork, such is the precariousness and vanity of academia. I made my work visible.

Figure 48: An interaction between Mark and me from 2017. He writes (top left) he had a good shift with clear passing arrangements, to which I replied with three photos of what it looked like from the water. He replies that it is "a nice complementary [picture]. Also, the turning is captured well." Figure 49: Tweet from 2016 retweeted by operator Jos, thereby appearing on the Rijkswaterstaat list.



4.3. Conclusion

Operators depart significantly from the visual tradition of the control room in a number of ways. From an organisational perspective, control rooms have always been the message, never the work. Representation runs through the very existence of control rooms: from architecture to inauguration, as a backdrop for reporting, as

a set for films, through signposts integrated into the interior, exclusive but frequent tours, displayed behind large glass windows, annual publicity stunts, through large screens and dashboards that are otherwise meaningless to the operator's work, etc. They mark ambition, promise safety, confer legitimacy.

In contrast, operators differentiate the public into publics, in line with the locality of the nautical control room, as manifested from the start in local political pressure to ensure safety at places where infrastructural complexity and the acceleration of shipping grew beyond the control of otherwise rather sovereign skippers. Second, operators offer a casual route to the visual literacy needed to understand the real situation they face. This is more than just opening up an inaccessible world. Thirdly, by addressing multiple audiences—often at the same time, as when recreational skippers are told how (not to) navigate busy rivers—it also shows that professional skippers are making efforts to counter the erratic behaviour that causes them stress. At the same time, people living along the waterways are reassured that Rijkswaterstaat operators are keeping an eye on things. Together, this allows the operators to avoid the insider-outsider conflict that characterises most infrastructure work. Fourth, through the persistent presentation of the near misses as dangerous, but as non-events nonetheless, they have found a way to legitimise control room work, not just control rooms, despite its success.

Nevertheless, operators remain visually oriented in their representations. In this sense, the operators' representation of the control room on Twitter is a gradual change, building on a representational tradition rather than breaking with it. At times, however, operators were engaged in a form of symbolic legitimacy that differed only in scale (local) in correspondence with the control room territory and Twitter affordance. Ironically, the thing it echoed, NORAD tracks Santa, was long acoustic at heart: children could call in to hear where Santa was, and the image used in the chapter is merely the sleeve of a record containing radio reports of Santa's whereabouts. It is also ironic that the otherwise dominant audio dimension of inland navigation control room work remained opaque.

The use of Twitter by control room operators should be understood, as I have shown, as a new and important marker on the continuum of which control room work and control room representation are part. In this and the previous chapter I have shown not only that the control room as a space has a dual function, but that the work itself serves both purposes, increasingly so.

This chapter has shown the direction in which control room work might move if the management's distribution strategy continues: rather than just making control room work visible, operators have begun to engage in visibility work. For the crews of patrol vessels, this trend is even stronger. If we look at the dynamics between different parts of the Rijkswaterstaat organisation, we can see the contours of a reshuffling: the rise of the operators pushed the river masters and their crew first into a centrally directed position and then into a representative role for Rijkswaterstaat as

network managers eager to connect with the public; the operators moved when their information position was no longer exclusive; as a result, it looks like those who used to be the public relations officers or spokespersons are now monitoring others who do this work for them.

Andrew Abbott (1981) has written about how income is generally correlated with intra-professional status: the higher the status, the higher the income. This is a paradox because the jobs most admired by the public have low intra-professional status, and vice versa. Abbott argues that "the highest status professionals are those who deal with issues predigested and predefined by a number of colleagues." (823) By contrast, "the lowest status professionals are those who deal with problems from which the human complexities are not or cannot be removed." (834) For Rijkswaterstaat, in a play on Abbott, it could be said that those who enjoy high public status have low status within the organisation, and vice versa. The operator has something to show for it, intervenes in a physical reality to achieve movement that is crucial to the lives of those living on and around the water and to the Dutch economy in general, whereas the people who work in the Corporate Service have less to show for it. Their workplace is not famous, but their position in the organisation is more secure, their work is less muddy and their pay is probably better.

Chapter 5 – Media of Separation

Figure 1: A family spends the afternoon at the Waal river, as seen from the Tiel control room in the summer of 2018. Figure 2: Photo of a radar-AIS interface in the Zandvliet control room, located in the port of Antwerp, taken in 2017.

"There is an enormous shortage in skippers," says Jerry, a skipper on a 135-meter long container ship, as we leave the Duisburg container terminal, heading for Rotterdam (Field note 29.3.17). Jerry explains that inland navigation is a "closed world, not many new people get in, also because it is hard to combine with a social life." (ibid.) There was a time when many families lived on board, but most family members have left the ships and now have a home on land. Many skippers left too, some of them became operators. Those left work long solitary shifts.[1]

Still, they manage to achieve quite a lot. Much of the international transport to and from the Netherlands is done over inland waterways (Filarski 2014, 357) and in 2014 Dutch ships made up 60 percent of the cargo capacity of the entire Western European fleet (374). Between 1950 and 2003, the Dutch fleet went from 17,000 ships to under 5000, while the transported tonnage grew 64 times larger over the course of the last two centuries (359). So, a significant economic contribution is made by a relatively small group, in 2014 of just over 17,000 people (374).

This requires ships to be almost constantly on the move. By following not only actors but also practices across multiple sites this chapter reveals how navigating

1 An earlier version of this chapter appeared in *Mobilities*, titled "Follow the Action" (2020).

inland waterways is accomplished both on water and on land. Thus far the static view from land has been dominant in this dissertation. This resulted in a double deficit: mobility and water were only studied from afar. The first deficit is inherent to the workplace studies on control rooms: most have reinforced the centrality of the control room by neglecting what is outside, whose movement is coordinated from inside. To counter this, I have mobilised my method and travelled with actors in the field. The field of mobility studies (cf. Sheller and Urry 2006) has managed to do this consistently. Through its interest in practices, integration with the fields and disciplines I have drawn on most so far—media studies, (historical) anthropology, workplace studies, and sociology at large—is possible.

In 2014 Anim-Addo, Hasty and Peters signalled a preference within mobilities studies for "mobilities ashore" (2014, 337). What's more, they determined the "absence of the sea from explicitly focused mobilities research" (341). The same is true for inland navigation, rivers and canals. The remedy would appear to simply study these types of mobilities more. After all, the promise of the mobilities paradigm is that it "remedies the academic neglect of various movements, of people, objects, information and ideas." (Büscher and Urry 2009, 99) It is suggested here, that in order to address this second deficit, sea and riverine mobilities should be studied more without replicating the land-water dichotomy, because that is what enabled the neglect in the first place. Anim-Addo, Hasty and Peters thought, following Steinberg (2013), that the explanation for the lack of scholarly attention for shipped mobilities partly lay in "the broader tendency in Western thought to see the sea as a lifeless backdrop, a realm distinct and distanced from the land." (341) As discussed in the first chapter, water has been made into a modern abstraction, clearly separate from land (cf. Linton 2010). While this conceptual hygiene is central to the modernist project, everyday practice is made up of hybrids (cf. Latour 1993). Thus, central control-local agency, land-water, and also nomadic-sedentary are oppositions often refuted by actual practices, as is the case with the practices presented here.

So, despite the fact that skippers live a radical mobile life compared to most, their mobility should not be essentialised. Rather, it is interesting to look at the blurry "interplay" between "movement and stasis" (Ramella 2018a, 336), and see how "the work of 'mobilizing' and 'immobilizing'" (Büscher, Sheller, and Tyfield 2016, 490) happens both *from* land and from water, and *with* those on land and on water.

This chapter benefits from practice-oriented work done in adjacent fields, which explicitly goes beyond the land-water dichotomy. Laura Bear's invaluable research on navigation of the Hooghly river by pilots covers both work on the river and the bureaucratic and capitalist structures that obstruct safer practices (2014, 2015) — Bear's work is also discussed in conjunction with Penny McCall Howard's equally impressive on work Northsea fishermen (2017) in the conclusion of this book. Ashley Carse has done great work on the Panama Canal, both on how the surrounding jungle became the catchment for the channel and thus nature became infrastructure

(2012, 2014) and how the canal is navigated (2020). Especially in the first two studies, Carse shows how any thorough understanding of the Panama Canal depends on both a land and water(way) perspective. Also relevant, in light of the land bias, is the work done on delta's (Morita 2016; Krause 2017) that aims to be explicitly amphibious (cf. McLean 2011).

The mobilities studied in this chapter were centred around waterways, but never stopped there, nor did the ethnographic fieldwork. The result is a three-pronged argument. One, it is shown how mobilising and immobilising is done through constant (re)positioning in four different orderings. Two, these navigational, regulatory, market, and intimate orderings are ongoing alignments of particular assemblages of human and non-human actors from across the land-water spectrum. And three, often actors need to give the market orderings priority and rearrange the other orderings accordingly, which results in palpable pressure, manifested in different problems of time. In all of this, (nautical) media play a central role: they keep separate what would otherwise collide and connect to deal with separation.

This chapter connects with a whole range of studies that have shown what bearing the brunt of achieving mobility looks like. Taxi drivers' bodies in North-American cities "recalibrate to the time of others as a significant condition of their labor." (Sharma 2014, 20) In U.S. truck driving practices "risks are absorbed in drivers' bodies" (Snyder 2016, 124). Those on board of inland navigation ships absorb risk too, though it is not as dangerous or exploitative as seafaring (Abila and Tang 2014; Roberts et al. 2014; Ellis 2018; Jensen and Oldenburg 2019). As in trucking in the U.K. (Gregson 2018), sanitation is an issue in inland navigation, as wheelhouses typically lack toilets, these are downstairs, while most of the time skippers are alone at the helm.

Here, I follow this line of work, but also seek to complicate the object of inquiry more than has previously been done. To gather steam and come into motion, or seeking to moor while being on the move requires far more than mastering navigational ordering: it involves (re)positioning oneself in regulatory, market, and intimate orderings, with multiple temporal problems unfolding that need to be negotiated.

In this chapter, I will highlight how the pressures the people in the field endure and mitigate manifest themselves temporally: in addition to being (just) in time, actors try to save time by accelerating, or even steal it, by cutting a corner and make others go in reverse; some manage to cunningly create time; synchronous pockets of time are coveted, especially with loved ones, but (4/5G) network coverage is often lacking; waiting time is a challenge as the isolation of the depopulated wheelhouses is felt; while sharing time with people not on board requires careful planning and bodily risk.

In the ensuing section, the methodology of this chapter is introduced, after which an overview of the field sites is given through the process of boarding ships. The empirical material is presented subsequently, in four sections, each containing

several episodes. Such is the progression in this dissertation—historiographical questions about rivers, land, and control lead to a meandering first chapter, which arrives at the transformation of skippers into operators as reflected in the media history of the control room in the second chapter, from where the contemporary visibility and accessibility of the control room in the light of its representational and architectural history became the focus of chapter three and four—moving from the diachronic to the synchronic, that ever more material has to be distilled, which results in an ever tighter structure, as should have been apparent in the previous chapter and even more so below.

5.1. Navigating research: follow the practice

This chapter is based on three methodological steps, in which the key theoretical assumptions are anchored. The basic premise underlying all these steps is that mobilities are best understood as practice and should therefore be studied ethnographically.

I. Following actors empirically

The first step is to "empirically follow" actors (Gherardi 2018). If actors are on the move, so too should the ethnographer. This is a point that Büscher and Urry make (2009), and is why I ended up boarding almost every type of ship on Western European waterways after I had learnt how traffic at critical intersections and in ports is coordinated from control rooms through intense interaction with ships. Wherever I went on board, I visited control rooms. As a result, I can now present an understanding of inland navigation, which emerged as much from a mobile as immobile perspective, as some intersections were studied from the control room before they were ever crossed on board. Operators also actively encouraged me to do fieldwork on ships; and on two occasions operators brokered access to a ship.

II. Action is distributed and dependent on media

Following actors made visible that they can move because of distributed activities. The critical action hardly ever happens just in one place. This is why sustained participant observation in one control room or on board of one ship would not have sufficed, as the key is to understand the interactions that make up inland navigation. Therefore, as a second step, a "distributed" (Schubert and Röhl 2017) mode of ethnography was necessary. It became clear that maintaining a safe distance between hull, embankment and riverbed is an accomplishment across different sites, achieved through sociomaterial assemblages.

Media play a decisive role in these assemblages. Media are defined here as technologies that actively mediate between different actors, radar being a good example. Through beams of microwaves it connects to other objects and helps identify other actors, which enables maintaining (minimal) distance. Media allow smaller margins and more risk, but not on their own. Like with a sonic depth finder, which critically mediates between skipper, hull and riverbed: it does not keep the riverbed and the hull of the ship separate by itself, a skipper has to act on the indicated distance, based on experience with an ever-changing river. Furthermore, it is important to stress that separation seldom means disconnection: in the case of the sonic depth finder, distance is the measurement of the time that acoustic waves take to connect with the riverbed and return (cf. Borbach 2020, 2024). What it boils down to, especially in mobile nautical work, is that nautical media enable the control of distances.

III. Follow the practice of ordering

What is built through assemblages across all those sites? How does acceleration, temporisation, and mooring come about? Lucy Suchman's concept of "orderings" best explains this (1997). An ordering consists of "local interactions of participants" (ibid.), and is particularly apt to capture both the temporal *and* the spatial aspect of the organisation of mobility. Like with aviation or rail traffic, inland navigation is rife with critical events where spatiotemporal control needs to be achieved. More than 'arrangements', 'constellations', or 'networks', orderings emphasise a necessary spatiotemporal intervention, both in creating distance and drawing things near.

The notion is introduced in Suchman's "Centers of Coordination" (1997), central to the workplace studies on control rooms discussed in the previous chapter. There, she brought together many studies on control rooms (Harper and Hughes 1992; Heath and Luff 1992; Filippi and Theureau 1993), including her own on airport ground operations rooms (Suchman 1993). Central to the organisation of mobility was the idea of "ordering[s] from within" (Suchman 1997), which other studies on control room work had also emphasised (Button 1992; Harper et al. 1997), though not as clearly integrated into a practice theory. Instead of an overarching external order, orderings only come about "in the mundane reproduction of everyday activity" in which "the social world is reiterated." (Suchman, Gerst, and Krämer 2019) One might think a schedule is an external order, but even in aviation control rooms or train dispatching, in which schedules are important, mobility is not the result of the execution of a schedule, but of "situated action" (Suchman 1997) or "situated organisation" (Heath and Luff 2004, 117). A word that is often used in control room studies in this respect, which seems apt to describe work in the wheelhouse too, is "ongoing" (Suchman 1993, 114; Heath and Luff 2004, 117).

In this chapter, two steps are made beyond Suchman's work and the control room discourse: 1) orderings are studied from both the mobile and immobile perspective,

in the control rooms and on board of ships, and 2) the notion of orderings is expanded beyond the direct organization of physical movement.

The first point follows logically from the prioritisation of the locale of interactions, which is more than a consequence of following the actors. It is about following ongoing situated action across sites. However, this has rarely happened in studies on centres of coordination, nor is it common for mobile ethnographies to substantially draw on immobile sites. There are four studies that have combined mobile and immobile perspectives: Johan M. Sanne complemented his air traffic control fieldwork by joining the cockpit during flights while focussing on safety (1999); in her ethnography on labour, austerity, and infrastructure Laura Bear followed a variety of workers on and along the Hooghly River (2014, 2015); Benjamin Snyder studied both truckers and their dispatchers ethnographically as part of a broader interest in the disrupted workplace (2016); and Anna Lisa Ramella observed how rock musicians, both when on the road and at home, perform mobility and immobility through practices of mobilisation and immobilisation (2018a, 2018b, 2021). All these studies informed mine, but especially Snyder and Ramella sensitised me to issues of coordination, rhythm and temporality. Still, none were as interested in the trajectory of ongoing situated action across sites, nor tried to capture how so many different actors manage to relate to each other on an everyday basis. To follow practices of ordering allows for scaling up and seeing how inland navigation works.

Therefore, the second step beyond Suchman's understanding of orderings is to consider other activities as orderings, as long as they are intertwined with the organisation of the physical movement and require active intervention. Although not as rigorous as grounded theory, the four different types of orderings—regulatory, market, and intimate, in addition to navigational—are rooted in what I observed in the field, and thus not an external order of my own that I projected onto the field a priori. It became clear that skippers and operators were not only involved in accomplishing navigational orderings, or to put it differently, navigational orderings were depending, both in constraining and enabling ways, on three other types of orderings.

To conclude this section, it can be said that it is not enough to mobilise methods when trying to understand complex modes of mobility such as inland navigation, as will become apparent in the following sections. The three steps described above—follow actors, distributed across time and space, brought together in situated action—are part of one approach, which can be summarised as *follow the action*.

5.2. Boarding the ships

I have already written quite a bit about the accessibility of control rooms. As for the second strand of ethnographic fieldwork, conducted on board four different Dutch

ships—sailing between the Netherlands, Belgium and Germany, mainly focussing on the Rhine and its tributaries and branches—I had thought access would be even harder, but it took little effort to convince skippers. The difficulty was more finding them, which always required an introduction by a family member living on land whom I had met in the field, and once through my social network. The four boarded ships—selected in an effort to capture the diversity of commercial inland navigation—were:

The *Tigris* (193 x 22 metres) is a push boat and part of a fleet that is owned through a Dutch shipping company by a German steel producer. It transports iron ore from Rotterdam to Germany in up to six large steel barges tied in front of it. It had a crew of seven with Pat and John as the captains.

The *Liberty* (135 x 11 metres) is a privately owned barge, as most ships are. The owners are a married couple, Rebecca and Rob, who were born on a ship themselves. They are chartered per voyage, so with the help of several agents they broker their next cargo while on the move, which is the dominant economic model.

The *Sunrise* (135 x 14 metres) is a container ship owned by William (and his brother), with Jerry as second skipper (who was quoted in the opening paragraph). They are time-chartered by an agency, which means that they do not have to broker their own cargo, and sail back and forth along the Rhine between Rotterdam and Duisburg. Time-chartered is financially stable, contracts often run for a year or more, whereas with chartered per voyage profit and loss are hard to predict.

The *Porter* (110 x 11 metres), a tanker owned by Maria and Philip, is also time-chartered. Tanker shipping is subject to tight regulation: fire drills were frequent, electronic devices were not allowed on deck (because they may ignite the fumes of the chemicals), alcohol was banned on board, and every freight required extensive documentation (Figure 3).

Principally, the ships could not stop for an unimportant passenger like an ethnographer to get on board. Therefore, either an inevitable immobilising moment had to be seized upon, for example in a lock, or a moment of synchronous movement had to be created in the form of another (smaller) ship making the drop off. Strictly speaking a ship is not completely immobilised in a lock, it is just that movement is vertical instead of horizontal. The *Liberty* was travelling down the German river Main. Rebecca texted: "could you come on board (…) at the beginning of the Main? We are there late Sunday evening late." (Field note 27.11.16) Shortly after, she called and said they would have to pass 40 locks on the Main, so predicting a time would be hard, but 23.00 was their estimate. We agreed that I would wait at a lock near Frankfurt from 21.00 onwards. Three hours later the *Liberty* crept into the lock with only 30 centimetres margin on either side and I climbed aboard. Rob and Rebecca explained that they had often been unlucky with the single locks, where traffic from the opposite direction had repeatedly called in first (ibid.).

Figure 3: Philip shows the documentation required for one 20-hour journey. Making their journeys accountable was primarily done by Maria. Authorities, for instance a Rijkswaterstaat patrol vessel, could demand to see these documents at any time, although in practice this never happened. However, the danger was not only a sanction from authorities. Stakeholders in the tanker shipping industry have agreed that a serious safety-related failure will results in the indefinite blacklisting of those involved.

The *Tigris* and the *Sunrise* could be boarded once they had docked. Both could tell when they would arrive in port, but not when there would be space to berth, so their arrival time was kept as a marker. For the *Sunrise*, I had to get to the Duisburg, Germany, container terminal, part of one of the world's largest inland ports. These infrastructures are not made for strangers, especially not those on foot. Public transport will only take you so far. While walking on the shoulder, trucks raced past. After registering at the gate, Jerry picked me up, handed me a yellow vest, and we boarded the ship while it was being loaded with containers (Field note 29.3.17). As told in the prologue, there as only one taxi allowed on the vast metallurgy grounds, which include private docks, to bring me to the *Tigris*. The estimated boarding time had changed many times. At 7.00, a boat picked me up in an industrial landscape. The *Tigris* lay mid-river, using the current to turn downstream while the boat dropped me off (Field note 11.10.18).

Boarding the *Porter* was a matter of synchronising movement. The *Porter* is a tanker and as such legally restricted in where it can moor—a regulatory ordering at work. After our rendezvous failed twice—every time the *Porter* had to leave earlier than expected—I was on my way to the Rotterdam port from Cologne when Philip called. They would leave any minute, so my best chance was to get to Dordrecht, east

of Rotterdam, where there was a mooring place they were allowed to stop at. When I got there, Philip called again and told me to go to the local inland navigation traffic control room, which I already knew well.

It turned out that Philip had asked for a favour through his brother-in-law—who is an operator in another Dutch inland navigation control room, upstream—had asked for a favour: could a patrol vessel drop off a passenger mid water? Knowing the limitations of tankers and the time pressure skippers are under the patrol vessel agreed. While I waited in the control room, the *Porter* could be seen approaching on the control room screens long before it came into direct sight. While the patrol vessel sailed parallel, its skipper could see the exact speed of the *Porter* on his interface, and reduced the distance between the two ships to a small step. On board, Philip told me that they had rented out their ship to an agency that arranged their freight, called time-chartered shipping, which made their lives more predictable financially, but gave them minimal control and therefore little insight into where they would be when (Field note 19.2.17).

5.3. Undetermined future: conflicting priorities in navigating rivers

In two episodes, it is explained how a ship sails from its current location to a near-future destination. Most actors involved want to know what the others plan to do, so they can imagine a near-future ordering in which there is place for them too. The future is indeterminate in the sense that there is no timetable, but depends instead on situated action. This does not yet explain how a voyage is completed, or how the cargo is found in the first place, but shows how ships move through small actions and what role the control room and other traffic play in this. First, it is argued that the most elementary orderings of navigations are made through the dual assemblage of accounting and steering clear, and then that at times a third position, that of the control room, is necessary to achieve this.

Episode one: accounting and steering clear—navigational ordering seen from the wheelhouse

This episode stands out as it does not directly cite from the field, but is based on a whole range of observations. This allowed me to formulate that at its most elementary level, navigation is the repetition of three steps in ever changing conditions: 1) separating hull-water-riverbed, 2) determining current position, and 3) relating current position to the near-future position.

The ordering of hull-water-riverbed depends on accounting for the water level, draft of the ship, and the width of the shipping lane. Most ships have a sonic depth finder, which is particularly important during low water and when a heavy cargo

is transported and the ship lies deeper, and thus margins are slimmer. Otherwise skippers can rely on the shipping lane, marked by buoys and drawn on their digital maps. The shipping lane is kept stable by frequent dredging and regular inspection by Rijkswaterstaat patrol vessels. At fixed, shallower points on the Rhine, national nautical authorities permanently sound the depth of the river and communicate this to waterway users as the "least measured depth".

The second step in navigation is determining the current position, which is, compared to shipping at sea, as Hutchins describes in his seminal work (1995), a relatively casual task. This is due to the familiarity of skippers with the river and the abundant access to visual markers on the river banks and beyond. This is best observed during a shift change, when the new skipper or helmsman climbs the stairs to the wheelhouse. During the day, with good visibility, the first thing she or he does is look around through the panoramic windows of the wheelhouse. At night or during thick fog, the first thing they do when coming up is ask, and orientate by looking at the screen that displays the nautical map indicating their position via GPS.

To link current location and future destination—the third step of navigation—does not require a detailed plan. Construction work on locks or bridges, and occasionally bad weather, may require an alternative route, of which are few. Navigation as "situated action" (Suchman 2007) is about how to navigate the shallows, bends and currents of the river itself and passing other ships (and objects like bridges and locks). Across the width of the shipping lane, passing arrangements can be made extemporaneously through marine VHF radio. If allowed, as is the case on Dutch waters, starboard-starboard passings are carried out too, making for a more diffuse traffic pattern. Apart from the occasional dredger or anchored ship, everything is on the move, which is difficult to change: bringing a ship to a standstill can take several kilometres, as we have learnt from the incident with the *Jaroslaw* in chapter two. This constant movement and limited intervening capacity is a key spatiotemporal dimension of inland navigation. It requires actors constantly to anticipate the next ordering.

Other ships are accounted for through an assemblage that involves scanning the waterscape optically, listening in to the local marine VHF radio frequency, reading the overview that the AIS offers and the picture of surrounding objects that radar provides. AIS (Automatic Identification System) is a geo-locative system that through radio signals exchanges names, GPS position, departure and destination of a ship, which are then plotted on the nautical map. This exchange of positions is not frequent enough to navigate directly on the basis of this information, but it does provide a sense of traffic out of sight, around a bend, which cannot be seen by radar because the embankment blocks the radar signal. The dissemination of AIS was subsidised by the Dutch state before it was made mandatory.

Figure 4: (top left) Tigris's console is positioned to the side to provide a clear view of the deck and sailors, as photographed in 2018. Figure 5: (top right) Captain Pat of Tigris in radio contact with those on deck tightening the barge's lashings. Only from the wheelhouse can you see if the whole combination of pushboat and barges is straight. Figure 6: (second left) A helmsman of the Tigris went to the bow, 180 metres from the wheelhouse, to help enter a port. The barges have no electronics, so no CCTV. His hand on his chest means he is talking or about to talk on his radio, indicating to the captain to leave the frequency. Figure 7: (third left) Philip, captain of the Porter, operates the bow thruster with his left hand as the ship moors in the Antwerp docks in 2017, allowing him to move sideways. The bow thruster is controlled with one hand, indicating both direction and power. Behind his hand is the double throttle for the main engines, between which his hands alternate. His right arm is on the rudder. Figure 8: While navigating the Western Scheldt, Philip adjusts the scale of his AIS-layered chart, as the estuary is wider and vessels sail faster, requiring earlier detection. The radar is displayed on a separate screen at knee height in front of him.

Figure 9: The captain of a ferry navigates with two adjustable propellers, the steering is done by rotation, while the rotation of the propellers depends on the angle of the two sticks. I joined two ferries: one on the Waal, the other on the Oude Maas in Dordrecht for several hours. These ferries are very manoeuvrable and fast, as they have to slalom through the up- and downstream traffic while crossing the river. Figure 10: Photo taken aboard the Liberty in late autumn 2016, just past Mainz, with fog clearly visible on the horizon. It is not often that it announces itself like this. The time of year means it is expected, but the exact appearance can often still be a surprise.

It allowed the minister of Infrastructure and Environment to argue in 2015, at the height of the conflict between operators and managers, that control rooms could make do with fewer staff (see chapter two). When skippers are outside control room territory, they make themselves accountable by sharing their intentions and propose passing arrangements amongst themselves through marine VHF radio.

To account for other ships is one thing, to steer clear of them is another. To move from the present ordering into the desired near-future navigational ordering, another assemblage is needed. The link between the two assemblages—accounting and steering clear—is made by the skipper (or helmsman). There may be more than one person in the wheelhouse, but for the length of a shift only one person is responsible for linking them (figures 4 till 9). The steering assemblage unfolds through the interplay between the river, the shape of the hull, the helm and rudder (connected hydraulically), the regulator of engines that power the propellers (most modern ships also have adjustable propellers up front, called bow thruster), the cargo (and how it is distributed), the skipper and the feedback she or he receives through CCTV cameras (detailing the separations in locks), the sailors on deck (communicating over the internal radio frequency), the engine display (with fuel consumption as an important parameter). In these complex assemblages, it is easy to overlook the role of the skippers' sensory faculty. When accounting for the environment and relevant objects and when steering clear of them, skippers are able to verify and complement informa-

tion through an interplay of their senses and media (cf. Willkomm 2014, 2022). However, to steer clear of unaccounted objects is difficult, for instance when fog comes in to fill the waterscape (Figure 4.10). Then reliance on mediated detection becomes near total.

On a river (unlike a canal) there are no long straight stretches, no stable volume of water, no even riverbed. This means that navigation at its most elementary level has a short time perspective in which present circumstances are manipulated to achieve the desired near future.

Episode two: Conflicting temporalities of navigation—seen from the control room

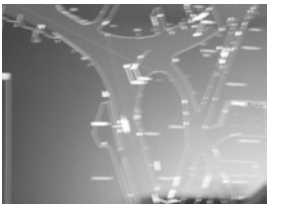
The basic picture painted in the previous episode is complicated here by describing the role of control rooms in different orderings. It reveals a fundamental temporal conflict in inland navigation between professional and leisure skippers. What becomes apparent is that the control room operators, when contributing to the accomplishment of regulatory orderings, are torn between market and navigational orderings.

To allow for safe and smooth passing at intersections and in ports, control rooms take up a coordinating role, as traffic is much more intense there. When everything is on the move, the place where this movement intersects becomes a "choke point" (Carse et al. 2020). The control room is elevated, not unlike air traffic control towers, but more than a direct view, an assemblage of (among other things) CCTV cameras, cargo databases, radar networks, and AIS, bundled into two rows of horizontally linked screens, provides a real-time overview. Every section on the river has a dedicated marine VHF radio frequency, and within control room territory, the operator as a rule takes the initiative when intersecting courses have to be smoothed out into new orderings.

The second episode evolves around leisure skippers. As a rule, leisure skippers are not deeply integrated in navigational orderings, relying primarily on direct sight to account and be accounted for. In the field, the presence of leisure skippers was met with little enthusiasm by skippers and operators alike, though, for a senior policy adviser at Rijkswaterstaat, the infrastructure agency of the Dutch state, they had found their place through a market ordering: "leisure skippering is a multi-billion Euro industry." (Interview 8.6.15)

In the previous chapter, I analysed how operators make their efforts to deal with leisure skippers public. Here, I focus on how operators keep track of them and are often asked by professional skippers if they have had contact with a particular yacht and know their intentions. In theory, this episode could be relayed afterwards on Twitter, were it not that this operator, Jan, is not on Twitter. He is the oldtimer who contributed to the oral history in the second chapter.

Figure 11: The P2000 display indicates that a skipper has run aground, a call made by operator Jan. It is "P 2", or Prio 2, which means it is urgent but not life-threatening. It is mentioned that it is a leisure skipper. Figure 12: The best operator Jan could do to get a view of the yacht, a few kilometres away from the CCTV camera, with a white sail out, left of centre. Figure 13: Failed attempt by the author to photograph the marked yacht, now at the intersection of the Dordtsche Kil and the Oude Maas. The lighting and movement made it hard to capture the interfaces photographically.

On a clear summer day in 2018, Jan was called by the skipper of a yacht over the frequency shared by all traffic in that section. With a distinctly upper-class accent, and using full sentences rather than the terse VHF radio lingo (both of which indicate that he is from another world), the man explained that he had run aground and damaged his keel and rudder (Field note 15.8.18). Jan issued an alert on the P2000 system (Figure 11) and searched for the ship by zooming in with a CCTV camera (Figure 12). The patrol vessel, which had just returned to Devil's Island at the end of its shift, was sent out again by Jan. Before the patrol vessel had arrived, a professional skipper had pulled the yacht clear, we could see on the CCTV screen. Jan was not surprised it was a professional skippers: "Another leisure skipper won't come and help." (ibid.) Over the radio the yacht indicated which port he would seek and thus how he would cross one of the busiest intersections of Western Europe, where traffic to and from the Rotterdam port, Antwerp port and Germany converge. When he subsequently did not sail accordingly, he was no longer replying to calls over the frequency. Jan was not surprised, as he had—"preventively" (ibid.).—marked him in a contrasting colour in his interface (Figure 13). Only Jan could see the marked yacht, he (a former skipper himself) had accounted for it on behalf of other professional skippers.

The regulatory orderings that operators seek to co-constitute are always tied between navigational and market orderings. Remember the official motto of the Rijkswaterstaat control rooms is "safe and swift". Apart from when he got stuck, swift was no priority for the leisure skipper, and his subsequent behaviour showed he did not share the same understanding of safety as the professional waterway users and regulators.

Linking a present location to a future course depends on the accountability of others as much as on giving an account. Where skippers act under ever-changing

time constraints, leisure skippers have all the time in the world. Operators assume a mediating role, a third position, in their attempts to reconcile these different temporal regimes into navigational orderings.

5.4. Just in time: navigating competition, speed and low water

The next three episodes are concerned with what is done to be just in time: skippers explicitly become competitors, taking more risks, with operators reaching the limits of what their assemblages allow. All these instances have to do with low water. For those ships chartered per voyage, low water results in lucrative freights, as more ships are required for the same amount of cargo to be transported—demand outstrips supply. Thus, it gets busier on waterways and ships sail faster (also afforded by lower weight) in order to pick up the next lucrative freight. To understand what is at stake in these episodes, rivers have to be understood as actors too, a view that was developed already in the first chapter, but now we can add the perspective from aboard.

Despite centuries of cultivation rivers are living. This is manifested not only in varying water levels, which, as discussed above, are kept a close eye on by skippers and authorities alike, but also in the current and the riverbed. Skippers know intimately how the current influences their course and speed, and where, closer to sea, it meets the tide. Through erosion and sedimentation, the currents mobilize and immobilize constantly, which is apparent to those who navigate it regularly, always in search of deeper waters and cautious to avoid sandbanks. During low water, the riverbed can change quickly. This is enhanced by the fact that all ships use only the centre of the shipping lane, digging a new channel in the riverbed as their propellers come close to it. People shape the landscape both by dwelling and through the paths they create, which renders a "taskscape" visible, in which "is sedimented the activity of an entire community, over many generations." (Ingold 2000, 204) In riverscapes paths are created too, often over long periods of time, sometimes quite suddenly.

Episode one: closing time window—balancing draft, speed and riverbed

The first episode is about being *(just) in time* and took place in 2016 on board the *Liberty*, owned by Rob and Rebecca, who we know from the episode discussed in chapter two, when I was asked to take over the helm. Their ship was built in 2002, just before the building frenzy of 2005–07, which led to an overcapacity after the 2008 crash that was still being felt in 2016. This meant that their debt (several million euros) was close to the value of the ship. Rob said he wanted to sail until his last day, Rebecca would have liked to be closer to her children and grandchildren, but knew they had to keep on sailing for a while as their pension depended on it (Field note 27.11.16).

On board of the *Liberty*, we crossed a threshold in the river, a relatively shallow and rocky part of the German Mittelrhein:

> Rebecca comes up to the wheelhouse because we scraped some rocks. When we hit a rock, Rob immediately halts the engine. "We have pulled it off again" Rob says to Rebecca and Leo, their sailor, after we passed the critical section. The water level is dropping. They are carrying a lucrative freight and would not have been able to make it half a day later. (Field note 28.11.16)

The legally allowed minimum draft is the depth of the shipping lane minus a 30-centimetre margin. We had exceeded that margin and had 10 to 20 centimetres left, Rob thought. Clearly, their market ordering was at odds with the ordering that regulatory bodies desire. Rob switched off the engines because they would make the ship dig in the water, positioning it deeper. Rob's relief that they had made it "again" suggests that this happens more often.

The conundrum of the *Liberty* was that it had to run for the dropping water level while the speed required to do so made the ship come dangerously close to the riverbed. The faster a ship sails, the more water its displaces from under its hull, bringing itself closer to the riverbed. Dropping water levels cannot always be foreseen, even when freights are brokered on short notice, as often was the case for the *Liberty*. Once presented with the closing window of opportunity, Rob and Rebecca decided to dash for it. As a result, they put their navigational orderings (hull-riverbed) at risk in favour of their lucrative market ordering, discarding the official safety norm.

Episode two: losing time—the collective problem of acceleration

The second episode took place in the late summer of 2018 on board the *Tigris*, which could not afford to approach the riverbed any further and had to take it easy. Meanwhile, it was surrounded by ships that could not afford to *lose time*. When other ships speed up, competition increases and so do inequalities. The operators then intervene and become referees.

The *Tigris* pushed so little ore that the barges in which it was loaded lay shallower than the sizable push boat itself. The crew was uneasy with every faster ship overtaking them or narrowly passing them, taking away just that little bit of water they had left. Then, an operator from the Nijmegen control room, which coordinates traffic on the Waal (the main branch of the Rhine in the eastern half of the Netherlands), intervened when we encountered a smaller ship passing on our starboard. "Give a little more space, for that is a pusher," the operator said over the shared frequency (Field note 13.10.18). In doing so, the operator demonstrated an understanding of our manoeuvrability and critical draft, preventing the passing ship from taking away from

under our hull the little water we had left. That the operator was capable of doing so, that he knew how to embody the relevant dimensions and foresee the critical variables at stake, almost certainly points to previous skippering experience. The grateful helmsman retold the story at the shift change.

This shows that if regulatory orderings are not actively construct when skippers give market orderings preference, navigational orderings risk running into the ground. The rules themselves do not prohibit passing at high speed; sometimes it is even safer to just get out of the way. Regulatory orderings allow for smaller margins in navigational orderings.

Episode three: stealing time—breaking agreements and consensus

In an escalation of the previous two episodes, here a skipper breaks with the consensually constructed navigational ordering to reposition himself favourably, which those involved considered unfair behaviour. He was effectively *stealing time* from other skippers.

This episode I observed in the Tiel control room, built at the intersection of the Waal and the Amsterdam-Rhine Canal. It took place earlier during the same 2018 low-water period (Figure 14). That day, the marine VHF frequency was filled with an unusual amount of swearing and heated exchanges among skippers. Ships coming out of the canal needed the control room, its elevated position overseeing the intersection and its radar network, to know when to turn up the river, either up- or downstream. All the approaching ships, many of them racing to their next freight, would listen in to hear what passing arrangement was proposed by the operator. Normally, operator Nicholas said, they would propose to give way by steering wide or reducing speed themselves, but during these busy days those skippers chartered per voyage could make up for an entire year of losses (Field note 17.8.18). A former skipper himself, Nicholas was acutely aware of the situation. Then, a barge turned up the river, though it had agreed to wait for the current batch of downstream traffic to pass. Several other skippers called in that this was not agreed, one had to go in full reverse to reduce speed, with the current pushing the ship forward. At that point, all Nicholas could do was confront the offending skipper on the radio, who, Nicholas thought, feigned ignorance. If there had been an accident, Nicholas would have had to make a report (like Dirk did with the pilot on the *Jaroslaw* in chapter two), and the tape of the radio conversation would have incriminated the rogue skipper.

This navigational ordering persisted despite one skipper breaking consensus. The norm of marine VHF radio communication in inland navigation is that passing arrangements are carried out as agreed verbally (and more fundamentally that agreement is sought in the first place). And yet, cooperation still took place if we follow Goodwin's definition of "co-operative action" (2013): action was enabled by and built upon the "former operations of others" (Schüttpelz and Meyer 2018, 175–6).

First, the deviant skipper benefitted from the overview the operator relayed over the frequency and from the adherence to the passing arrangements by the other skippers, which made them predictable. Then, the other skippers had to operate their ship in adjustment to the sudden move so that an ordering came about nonetheless.

The episodes presented in this section dealt with spatiotemporal scarcity. It is argued that the increased competition as a result of the scarcity makes the intensified interconnectedness of orderings visible. The decision to accept bodily risk might seem an individual one, but has collective ramifications. Operators try to salvage situations, but run into the limits of their agency as they rely on adherence to shared norms, and nudge rather than command ships into a desired ordering.

Figure 14: Two ships turning into the Waal as seen from the control room in Tiel during the low water period in 2018. Both have little or no cargo, as can be seen by how much of the hull is visible. The smaller barge in the middle, third from the right, is the only fully loaded ship, with its hull almost completely submerged. Even when loaded, these ships do not lie as deep as other ships. Their niche lies in the smaller waterways they can still navigate, which are off-limits to today's average-sized ships. As low-water periods become more frequent, these vessels will enjoy a new lease of life, challenging the dominant notion in shipping culture that scaling up, and hence massive investment, is necessary to survive.

Figure 15: The tanker in the foreground is turning downstream, so is already on the starboard side of the waterway, while the barge is rounding the buoy to turn upstream on the port side of the river, which is the wrong side. Often the traffic does not allow the vessels to move immediately to the right side and they have to arrange starboard to starboard passages with the help of the control room. These photos do not capture the exact situation described in episode three.

5.5. Resting time: navigating with assemblages of surveillance

This section consists of only one episode. It deals with the dark side of permanent accountability. The point is that being accountable all the time amounts to surveillance at the expense of rest.

The episode was told as a story by William, the skipper and owner of the container ship *Sunrise* (Field note 30.3.17). It related to charter per voyage, which he no longer did. From the skippers' point of view, the introduction of mandatory AIS for inland navigation—since 2012 in the port of Antwerp, since 2014 on the entire Rhine, since 2016 on all Dutch waterways—was controversial. As detailed in chapter two, Rijkswaterstaat subsidised the installation of transponders, but not the investment in equipment, but privacy was the main concern of the skippers, according to a policy advisor (Interview 8.6.15). Now skippers could be tracked at all times, not just by government authorities, but by anyone. Services such as the popular MarineTraffic (website and app, Greek-owned, Figure 16) plot AIS signals on a map—it offers the possibility of tracking a selection of vessels. The Dutch skippers stipulated that the

AIS information would not be made available to the general public, nor would it be used to enforce shipping laws, such as mandatory rest periods. The Dutch state has conceded both points, but this does not prevent skippers from sending their data and that of the ships they detect to services such as MarineTraffic. As did Rob from the *Liberty*, who said that agents use this information to offer voyages that might benefit him (Field note 27.11.16). Relatives on shore also use it to track where their loved ones are. On board, skippers can use official AIS data plotted on their charts. William from the *s* said

> that he knows of skippers that have an illegal switch built in to shut down their AIS. This is not only about privacy, but also about competition. William: "When several ships have to load at the same place, for instance from a sea ship, the person who arrives first gets his load first, the others have to wait for several hours. You know or can guess that you are on your way there too (plus everyone knows each other). If you then go for a sleep (which for the sailing time law has a mandatory minimum length of 6 hours, everyone knows this), the other ship can try to just overtake you, and that could end up in winning a day. For those chartered per voyage, this really matters." (Field note 29.3.17)

Here, to be accountable and to account for others, is where regulatory and market orderings meet. If the skipper decides not to rest and continues to sail, he risks not only bodily harm, but also a much more severe sanction than being caught with a 'malfunctioning' AIS signal. For the latter, there is a 24-hour grace period in which repairs can be made without central registration, so a skipper can always try to pretend to be within those 24 hours. The international regulation of sailing time consists of skippers documenting their sailing time in a centrally issued red book and infrequent inspections by local authorities. This book records the ship's movements over time and the activity of each crew member. The minimum number of consecutive hours of rest is six per 24-hour period and half the time over the course of a week, so 84 hours of rest are required. As there are no tachographs on board, the skipper can document whatever the rules require and act differently. This is a very sensitive issue that none of the skippers felt comfortable discussing. If caught in the act, a vessel can be banned from sailing further, and falsifying rest and sailing times in the logbook is a criminal offence.

Different tracking regimes clash, one digital, one analogue. AIS is supposed to track movement, but captures stasis too, whereas in the resting time book, it is the skipper who tracks his own bodily stasis. The latter reflects whether the skipper managed to pause, made possible by handing over the helm to someone else, while the former in this case reflects whether the ship paused or not. In this story, the market ordering is explicitly visible—on a digital map, the AIS shows all the competitors—and felt through surveillance. However, this assemblage depends on the

detailed knowledge of skippers of the wider fleet, and how regulation translates into particular patterns of movement.

Figure 16: Screenshot of MarineTraffic, the free web browser version, in which I tracked the Sunrise, and found it moored in the docks of the port of Rotterdam in 2017.

5.6. Asynchronous times: navigating shipping and family life

The main difficulty in intimate ordering is synchronising shipping and family life. Intimate orderings are far-reaching. There are orderings established between crew members, guided by nautical hierarchies and traditions, which are intimate too. The focus lies mainly on partner(s) and/or family who were not on board—as it is with these orderings skippers seemed most occupied—though the time and space shared in the wheelhouse and control room are raised too.

The distance has made those who are still on board increasingly reliant on media to keep participating in those intimate orderings. Life on board depends on more than nautical media, although they are routinely integrated into nautical assemblages. The problem is that those on land often live to different rhythm. There are two ways to draw family near: 1) to stack the intimate ordering on top of others, which means searching small synchronous pockets of time in which mediated contact is possible, or 2) to actively make meeting loved ones happen by negotiating through media between orderings.

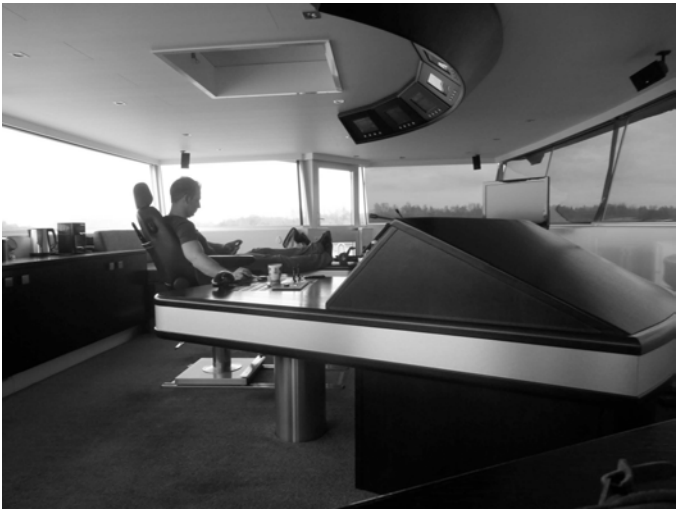
There are four episodes here: the first is an episode about finding pockets of synchronous time. Then I present an episode about relatively long stretches of solitary time, which were not solitary before. The third episode is about (in)tolerance during shared time with colleagues and the ethnographer. The final episode is about negotiating between orderings to share time and space with loved ones.

Episode one: pockets of synchronous time—stacking intimate orderings on others

At the very beginning of this chapter, Jerry explained how difficult it is to maintain a social life. He does not count mediated sociality as social. Work and social life—the latter understood here as intimate orderings—remain separate for him, even though he engages in various networked interactions with loved ones, some of which practices clearly predate the age of social media:

> Jerry has his girlfriend on the line (…). She asks when he will pass their house. He reckons around 1 or 2 o'clock, and says that is when William is steering. Connection is intermittent now, Jerry says he didn't get what she said. Routinely he says: "Not sure if you can hear me but perhaps it is better if we try to call later tonight, one bleep is yes, two no." (Field note 29.3.17)

Figure 17: Jerry—usually alone, but here accompanied by a photographing ethnographer—with his right hand at the helm and his smartphone in his left hand. Behind him on the left, a water cooker and a coffee machine, on the right a television, now turned off, but no toilet. Here the wheelhouse is in an elevated position (to be able to see over the containers the Sunrise is carrying), accessible only by outside stairs.



Jerry's girlfriend seems to be seeking a moment for them to be physically nearer, as their house is situated along the waterway the *Sunrise* will navigate later, but it becomes clear they live by different rhythms. William and Jerry alternated every twelve

hours, sharing a meal at shift change—both are one week on board and then one week off. Moreover, the near-real-time connection (notwithstanding the inevitable delay in transmission) is also slipping away. On every ship I have been on, I have witnessed actors struggling with poor mobile phone coverage. Mobile phone networks are clearly designed for different geographies of movement.

On the water befriended skippers sailed past now and again. At these instances, greetings were exchanged over the marine VHF radio frequency shared with all other skippers. On occasion, skippers would agree to switch to a separate frequency to chat as long as they were in radio range of each other. The pockets of time were never planned, but just happened spontaneously. In short, when stacking intimate orderings on top of navigational orderings, shared mediated time lasts as long as the connection holds.

Episode two: solitary time—media compete for attention

Especially during lonely night shifts, intimate orderings are far away. Retired skippers tell how night shifts used to be social events, filled with conversation and a game of chess (Interviews 5.1.18, 17.4.18). Now this time has to be filled in a different way. During the night shifts I was on board, the skippers were chatty, they seemed to enjoy having company for a change. Being alone in the wheelhouse is harder for women because the toilets are downstairs. As described in chapter two, in the limited time I was on board, I was asked twice and agreed to take over the helm when a skipper had to go to the toilet and her husband was asleep, even though I am completely unqualified.

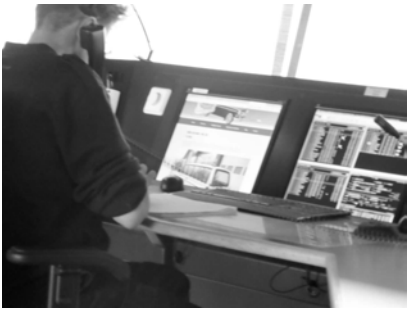
Otherwise, media keep the skippers company and are also used as instruments to keep them awake. Only the Tigris did not have a TV in the wheelhouse, and it was also the only ship where the night shift was not done by one person. The media—ranging from traditional scheduled television broadcasts to algorithmically driven on-demand viewing platforms or games on mobile phones—were used to fill the lonely hours, competing for attention with the navigational audiovisual input.

On the container ship the *Sunrise,* William and Jerry alternated every twelve hours, sharing a meal at shift change—both are one week on board and then one week off. Their sailor, Carlos, who was from the Philippines, visited the wheelhouse once during my two day stay, only briefly, his quarters were all the way to the front. Only on board of the *Liberty*, their (Czech) sailor Thomas was invited in twice daily for coffee and jumped in at the helm. The skippers and sailor mostly spent time together on deck, cleaning, checking cargo and, in the engine room, doing maintenance. Coming up after a nap, I saw that William of the *Sunrise*, was watching the series *Homeland* on Netflix during his night shift, on a large screen was mounted in a corner of the wheelhouse. He had never seen it before and decided to give it a try, running a few episodes during his night shift (Field note 30.3.17).

Phillip of the *Porter* used the waiting time in ports—their tanker had nine compartments that could be filled and emptied independently, which meant hopping from dock to dock in ports and more waiting time—to build model houses, meticulously modelled on a German village he had once visited and photographed for this purpose (Field note 20.2.17). Rob watched Dutch public television via his satellite (Figure 18), which, unlike William's on-demand viewing, followed a regular programme schedule. He liked a programme about neighbourhood disputes, about right of way and a tree hanging over someone else's property (Field note 29.11.16). He and Rebecca had a flat, but were rarely there. The show seemed somehow a symbolic access to a world preoccupied with mobility (a footpath) and mobilising the immobile (a tree) on such a modest scale.

Figure 18: Photo taken on board of the Liberty while navigating the Rhine in Germany in 2016. Rob is watching a show on adopted children looking for their parents on Dutch public television, which he receives via satellite. On the right parts of the radar interface and digital chart with AIS labels are visible, the chart is adjusted in brightness and the radar's main colour is black. As moderate sources of light they allow the skipper to still see what is outside at night. This is not the only contrast with the television screen. They are also integrated into Rob's navigational assemblage through their vertical position, so that the view of the water and on the screens is more compressed. The television is a horizontal screen, not designed to see beyond, therefore mounted in the corner of the wheelhouse.

Figure 19: An operator in a Rijkswaterstaat control room makes an enquiry per phone. On his right screen he is looking at a vintage car he is interested in buying, on the right is his cargo database. Figure 20: Part of a control room console, with on one screen the browser version of Facebook opened. Both this and the console above are less intense, more administrative. Although my interest in dividing attention by actors in the field was genuine, I have sometimes felt that photographing this amounted to surveillance.



As central as mobile phones are to a variety of critical assemblages, their affective appeal can tie operators or skippers too tightly. It is known from other contexts that boredom at work, especially during night shifts, can invite risk-taking (cf. Fassin 2013). In the Nijmegen control rooms, operators were very aware of the conviction of the German train dispatcher for causing a fatal collision in 2016 while playing a game on his mobile phone (cf. Truscheit 2016). The news broke on the day of my visit—operators were discussing in which type of infrastructure control rooms private smartphones were still allowed and in which they were banned (Field note 6.12.16). I later read that the developers of the game the train dispatcher was playing, Dungeon Hunter 5, promised it would be their "most immersive, accomplished and addictive" yet (Zibreg 2015).

Every burst of marine VHF radio chatter that fills the wheelhouse or control room can be vital. A television or smartphone is just one of many screens and gauges to keep an eye on (Figures 19 and 20), through which other critical orderings must be made. In the unmanned wheelhouse, the risk is no longer shared by the crew. Some of this risk is covered by new technology: the Tigris had an alarm installed for when the helm has not been moved for a certain period of time with the engines running. Nowadays, when there is an abundance of time on ships, there is often no one to share it with.

Episode three: sharing time and space—enduring intolerance

The final theme is *sharing time and space*, told over two episodes, first in the workplace and in the next episode with family and loved ones who are not on board. Here I want

to focus on an episode on board of the *Tigris*, supported by other experiences, also in control rooms. I have thought long and hard about including this, as it puts the people in the field in a bad light: it is about racism, bigotry, and homophobia. The key to including this is the way these issues manifest differently because of particularities of the field, like in chapter three. This is what justifies the inclusion.

During my stay on the Tigris, the national football teams of Germany and the Netherlands played each other, a classic rivalry in football and especially for the Dutch an important game. It had been a topic earlier that day, I knew it would be on in what they call the "mess" (Field note 15.10.18).

> Have watched a part of the first half half of Netherlands-Germany, but after a racist comment from the machinist, which I as a matter of fact did not let pass, I no longer felt like watching it. In a certain way this is a break with past experiences in the field. Before I have let these kind of things slide. Thought that I had to accept the field as it was, but now it was more directly addressed to me. He said it was such a pity that the Dutch team only played with four Dutch players, the others were foreigners. He meant the players of colour. (Field note 15.10.18)

The entire crew consisted of white men. It was through the television that an outside world had seeped in. The next day, the machinist came up to the wheelhouse, and stood behind me while I was typing on my laptop and said "Let's see what you are writing." I said he could go ahead. Then, in a voice as if he was reading it from the screen he said "Jordy [the first helmsman who was at the helm at that moment] is incompetent." (ibid.) Later, I made it clear to Jordy that this was not what I had written, but he already knew it was, he assured me. During the night shift, I was alone with John in the wheelhouse and the machinist became a topic. John could not afford to lose him, there was no one to replace him, but without saying much he seemed to know exactly what the machinist was. It reminded me of the story Ad van Zanten told (chapter two): once he knew who the bastard in his crew was, he should have kept him there.

Other incidents, which I did not object to when they happened, often involved the media and my presence. One operator used homophobic slurs as he told the others to be careful, my notebook was out, everything was being transcribed (Field note 4.11.16). Rob of the Liberty was talking on the marine VHF radio to an acquaintance who had just passed in the opposite direction and could not wait to be out of range when the acquaintance started talking about Sinterklaas, he said afterwards. The acquaintance thought that if a Dutch politician of Surinam heritage felt uncomfortable with Sinterklaas' assistant, Piet, wearing a black face, she should "go back to her own country" (Field note 28.10.16). It seemed to me that the exchange over VHF radio with other skippers often primarily served to foster links between people doing risky work, not knowing when help might be needed.

Episode four: sharing time and space—active negotiation between orderings

The final episode is the effort to share time and space with those who are elsewhere. It is about ordering oneself with loved ones to actually meet, either on land or on board. This is the challenge from which the operator-turned-skipper has freed himself.

Both Maria and Philip of *Porter* and Rebecca and Rob of *Liberty* took a few weeks off each year while another crew took over, all planned well in advance. The time was used to live in their house or flat, to see family, to travel. Neither could afford to tie up the ship for such long periods.

Smaller family events proved much harder to juggle with other commitments, especially market ones, as the following episode illustrates. Rob received a call from an agent offering a trip and answered his smartphone while at the helm. He was hoping not to sail the following Sunday as it was the annual family day with their children and grandchildren—a trip to the zoo and then dinner in Rotterdam. This meant they wanted to dock where they could get their car off the ship and be within a couple of hours drive of the city.

> Rob tells the agent about his family plans next Sunday. After he hangs up he mentions the price of 16,000 euros, and tries to figure out if the water levels allow for the weight of the cargo, so this is about the predicted water levels. Another agent calls. Rob receives a new offer, also steel coils, 17,000 euros, leaving from Antwerp, which means he has to go there empty first. Doesn't appeal to him. He asks if there is nothing for the Lower Rhine. (Field note 28.11.16)

Sailing empty meant covering his own fuel costs. For Rob to contemplate prices was to evaluate distance in time and future space on the river in terms of draft. The challenge is to geographically align navigational orderings with the intended intimate ordering, so as to switch: the intimate ordering cannot happen simultaneously, so other orders have to be paused. This requires negotiation, as Rob does with the agents.

On the Porter and the Liberty, they never know where their next journey will take them. This has made them familiar with a lot of the local infrastructure, partly because they had to get their children close enough to their ships, that is, when they were old enough to travel on their own between the boarding school and wherever the ship was moored. Before that, children were picked up by car from their boarding school for the weekend, regardless of where the ship was moored. From the 1980s onwards, skippers found ways to load and unload a car, mainly used for this purpose, although it was also convenient for doing groceries. Automobility augments and compensates nautical mobility (Figure 21). There were times when Rebecca of the Liberty would drive alone from southern Germany for five-hundred plus kilo-

metres to the Dutch boarding school on a Friday, drive back to Germany to bring her kids on board, returning them on Sunday afternoon, to drive back alone to Germany again (Field note 30.11.16). This way, she single-handedly amassed two thousand kilometres in three days. This illustrates that to align intimate orderings with market orderings implies taking bodily risks.

Figure 21: Rob unloading his car in the port of Antwerp in 2016 while on the phone.

The synchronisation of the different rhythms of those on board and those on land is difficult. When skippers are already engaged in other orderings and stack their intimate orderings on top of them, they are at the mercy of mobile phone coverage to convert available time in shared, yet mediated time. When there is no one to share time with, not only because of physical isolation, but also because of diverging rhythms, media keep skippers company. When intimate orderings are not residual but preferred over other orderings, when only the intimate ordering should be ongoing and the others put on hold, skippers manoeuvre to come to a market ordering that allows for an interval.

5.7. Conclusion

In this chapter, I have mapped out how ships on Western European inland waterways go from mooring to motion and back. Through sociomaterial assemblages,

four different orderings have been set out: navigational, regulatory, market, and intimate. In this way, ordering is an ongoing situated practice, distributed through time and space. The challenge, however, is for actors to reconcile the different rhythms across the water-land spectrum.

As a rule, practices can be studied ethnographically when zooming in, following actors wherever they go. However, when action is distributed, fieldwork should be too. It is shown that by following the action, different sites can be connected. As a result, ethnographies can be scaled up cohesively, without uncoupling itself from situated practices.

This approach helped to undermine the land-water dichotomy that has kept mobilities studies largely tied to land in at least three ways: control room work that necessarily has to happen from land, the ever-changing riverbed as a muddy taskscape, and loved ones who live by different rhythms on land.

First, it has brought us an integrated view of the efforts of inland navigation control rooms in achieving safe and smooth navigational orderings. Their mobilising ability rests on an overview that comes with being immobilised themselves. This is true in two ways: 1) most operators used to be skippers and actively use their knowledge and skills to deal with the demands that come with (re)positioning oneself in the different orderings while on the move, and 2) they can only utilise this experience when giving up the restricted view of the wheelhouse and embrace the removed, but not detached, view that the control room assemblage affords.

Second, the riverbed is jointly shaped by currents, ships and dredgers, and gives shape to how water flows and ships navigate in return. The less water the river holds, or the wider the river is, the closer the riverbed and the propellers of the ship come. Once they are too close, the ship will dig itself in, with likely calamitous consequences. Authorities try to secure this critical distance not only by deepening the river, but also by accounting for its state in the first place and restricting the maximum draft. Yet, skippers do not always align with regulatory orderings and instead stretch margins, but ultimately muddle through.

Third, intimate orderings tie shipping crews to land, either through stacking this ordering on top of others, or by negotiating a carefully timed mooring. The former means sharing mediated presence whenever the situation arises, which is easier to endure for hired crews who disembark after a week or two of sailing. The latter is a challenge for those who own the ship and carry the financial weight of not only immobilising themselves, but also the ship.

Four types of orderings have been theorised, which enable and benefit each other, but can also be at odds with each other. However, most often market orderings tend to prevail. When regulatory orderings allow for smaller margins in navigational orderings it is ultimately to the benefit of market orderings. Spatiotemporal scarcity on the river results in risky navigational orderings, spurred on by profitable market orderings. Climate change will likely exacerbate this.

Although low water is not uncommon, the 2018 low-water period on the Rhine described above was unlike skippers—some of them sailing professionally for four decades—had ever experienced.[8] With more dry extremes ahead and less routine to fall back on, problems mount, as this chapter demonstrated that less space on the river actually leads to more traffic. Until of course there is too little water left.

Finding a place in these orderings results in three main temporal challenges. Ships struggle to be just in time, made into a collective problem by the (lack of) water, though not always perceived by all skippers that way. Skippers are pressured to keep on sailing through assemblages of surveillance while in need of a break. And, third and last, conflicting rhythms make it hard to synchronise time (and space) with those on land.

In this chapter, I demonstrate that the empirical method needs to take account better of the distributed nature of complex interactions of actors by following their action. Analysis shows that these situated practices can themselves be theorised into four distinct, but interrelated orderings. This gives us an invaluable perspective on a hitherto under-analysed nexus of competing and conflicting priorities in shipped mobilities. Furthermore, the analysis sheds light on how human and non-human actors involved in essential work interact, when time is of fundamental significance. Ultimately, the way in which navigation on these waterways is accomplished by actors from both water and land brings into stark relief the central role of media to a fundamentally important infrastructure.

I have long relied on Zielinski's (2006) definition of media, on the idea that media are "spaces of action for constructed attempts to connect what is separated" (7), but found that it only covers one side of the coin. Alternately, it is shown here that media—depth finder, radar, marine VHF radio, smartphones, CCTV cameras, AIS, maps—keep separate what would otherwise collide. This perspective is afforded by escaping the boundary between media and technology (cf. Kittler 1999) and embracing an "open" understanding of media (Bender and Zillinger 2015, xxvi). This way, I could study the role of infrastructural media (cf. Schabacher 2013) in assemblages.

Media enable the control of distance. The question is not whether the connection or separation is attempted, but the practices of oscillation between proximity and distance. Every day, the challenge is to find out how close is still safe and how distant is still manageable.

Conclusion

Figure 1: A shipwreck from 1895 resurfaced on the Waal in the autumn of 2018 during extremely low water, as seen from the Tigris. The skippers knew about the accident that brought it there: the dynamite it was carrying exploded, allegedly caused by a steam engine hatch that had been left open.

The Rhine is a European river, one through which European integration—institutionally the earliest—was achieved, a process described in chapter one. What Schillmeier and Pohler write about the Danube once also applied to the Rhine. They argue that it is studying "the flow of a European river like the Danube that re-imagines Europe and Europeanization as a 'fluid space' (Baumann, 2000) enacting multiple, heterogeneous and highly disputed spaces of natures/cultures." (2010: 27) The confluence of nature and culture (cf. Latour 2007), is used by the authors because the "Danube never becomes socially relevant as an exclusive form of pure and unaffected 'nature', nor as a 'culture' solely produced by humans. Rather, it is always and at the same time a cultural and a natural object." (ibid.) For them, "new social, cultural,

political or economic relations occur that reach far beyond national configurations" (25).

Though they argue that a shift should take place from studying Europeanization on the level of "symbolic (b)orderings," (26) they do not propose a viable alternative level of study, a more concrete and empirical entry. This is where infrastructuring research comes in, offering a way beyond the physical structures that facilitate critical action (mobility, communication, commerce, etc.) to the everyday reproduction of infrastructures. In this book I show how, on the river, this reproduction of shipping lanes, of the exchange of up-to-date hydrological and geographical information, and ultimately of safety and mobility, takes place through shipping itself. If, compared to the Danube, the transformation of the Rhine seems to be a thing of the past, its current state requires a massive stabilisation effort on the part of all actors involved. Despite these efforts, it has become clear that with climate change as the ultimate unruly nature/culture, the stability was relatively short-lived.

Ships, guided by control rooms, are shaping the riverbed with their propellers, and they are constantly gathering and exchanging critical information. Therefore, the critical places to study the Rhine are the wheelhouse and the control room. Like the control room, the wheelhouse is a highly mediatised working environment. As a result, Rhine skippers have become less reliant on crew members to provide information from other parts of the ship (engine room, hold, bow) during navigation, resulting in a reduction in crew size. I have shown that the key to unlocking mediatised interaction in the wheelhouse is to study mobile and mobilising technologies as embodied practices. As such, they are a matter for media studies.

In this conclusion, I look back at 1) the presumed invisibility of the field, which is an important but sometimes misunderstood issue in infrastructure studies; 2) also list key contributions to various fields, including my own; and 3) review the practice theory insights I have produced, before looking forward 4) and outlining what a practice theory of navigation might look like.

1. Presumed invisibility

This book is an attempt to be methodologically versatile: it opens up, both diachronically and synchronically, a world of crucial importance that has long been overlooked, a world that is responsible for a large part of the transport of goods and raw materials between Germany—a major industrial producer and consumer market—and the Rhine, Maas and Scheldt delta, at the end of which lie the ports of Rotterdam and Antwerp, the main logistical hubs of the European market.

Much has been written about these rivers, but as far as I know, no one has delved into the daily lives of those on board, or into the places where waterborne traffic is coordinated, ships registered and supported. These control rooms often occupy a

prominent place in the landscape. So neither shipping nor infrastructure is invisible, but rather unnoticed, perhaps hidden in plain sight. Susan Leigh Star (1999) famously wrote that infrastructure becomes visible when it breaks down, and for the control room in Dordrecht, this was the case for me when I watched the public broadcast in 2015 in which the operators sounded the alarm: the control room was understaffed and underfunded. But for the local public in the Dordrecht region, the control room was never invisible. The control room is what Devil's Island is known for, Rijkswaterstaat made sure of that. But it was also these local people who demanded that Rijkswaterstaat take over the control of traffic on the waterways in the first place, as I described in chapter one.

What remains invisible to the naked eye, however, is the infrastructure as a whole. The challenge of scaling is central to *Paris: Invisible City* (2006), in scope an exceptionally ambitious book by Bruno Latour and photographer Emilie Hermant. They argue that the city is only visible in "small wholes" (45). One example is the control room for traffic and public safety in Paris, with its hundreds of CCTV cameras across the city and the Paris ring road, with its huge map of traffic flows controlled by automated traffic lights. They visited this control room and spoke to the senior police officer in charge, called Mr. Henry. It is not about the panopticon, they write: "Far from wanting to know everything [Mr. Henry] would like the millions of Parisians to stay as they are, composed of individuals that he never has to know personally." (56–57)

It sounds as if Latour and Hermant were given a tour. This is routine practice in most control rooms, many have deliberately built in the possibility, as we have seen, and the tours are (increasingly) not given by the operators themselves but by a designated member of the infrastructure organisation. From those who have stayed longer and actually done fieldwork in control rooms, we know that operators are preoccupied with ongoing sequences of events, often detailed and very local. Latour and Hermant never captured these daily routines, and as a result disruptions, congestion and malfunctions are absent.

But through text and photo collages of many small wholes, and by tracing the circulation of things, data, goods and people, they came very close to making Paris visible. In the sum of all their visits, wanderings and tracings, a comprehensive image of the city begins to emerge. This is in contrast to workplace studies of control rooms, which tend to stay inside and do not claim to capture the larger infrastructure. Like the operators, they are only interested in the next event to be dealt with.

This book does both, which is rare: it captures the work—the routine, the volatility—and ultimately paints a picture of contemporary North West European inland navigation. If the whole of Paris emerges when you digest the mosaic composed by Latour and Hermant and, as they put it, "refrain from looking outwards" (2006:11) and abandon the panoramas, then inland navigation, too, only becomes visible as a whole in these pages, a small whole itself. The nautical media that allow constant

scaling are crucial. I show that skippers-turned-operators are not looking for a panorama when they look out, but are trying to understand minute variables at a glance, provided by their skilled vision, in relation to what cargo databases, nautical charts overlaid with radar and AIS, and the chatter on the VHF frequency tell them.

2. Transdisciplinary

First of all, this study enriches media studies with perspectives from anthropology, workplace studies, sociology and mobility studies and adds to series of studies (cf. Passmann 2018; Ramella 2021; Willkomm 2022) that show what media studies can look like after the practice turn (cf. Schatzki and Knorr-Cetina 2000). German media studies already knew that there are many crucial media technologies beyond consumer culture. I explore the nautical media that are an integral part of everyday life, of work, of mobility, and I show that they need to be studied in situ and in motion. Before asking what media mean, one should ask what they do and what is done with them.

This study also contributes to the disciplines mentioned above, and in this sense it is transdisciplinary. In the case of sociology, I show in chapter two how rivalries between professions materialise. Existing relationships are consolidated in specially developed media (the traffic simulator) and change is provoked by the dissemination of a previously exclusive perspective (the subsidised introduction of AIS). Moreover, in the age of social media, the communication of the authority of the control room to the local public no longer takes place without the participation of the operators: public relations departments now deploy them for this task. As for anthropology, while a prominent perspective in several chapters, the fourth chapter explores the practices of gatekeeping as a socio-material practice, and the fifth chapter shows media as both cause, counter-strategy and coping mechanism of isolated life in the depopulated wheelhouse.

Building on workplace studies, nautical control rooms and shipping are brought into the same picture. I show that the coordination of traffic is an ongoing accomplishment by operators and skippers. By drawing on mobility studies, movement can be taken into account, although even in mobility studies the view from the water has been largely absent. By including more and more positions, both static and mobile—together involved in the work of mobilising and immobilising just in time—scaling became possible for me too.

I have adapted the Latourian adage of following-the-actors and tweaked it into following-the-action, seeking what binds different actors together. Scaling here is not a matter of zooming out, but of the sum of the intertwined action being observed. I argue that in order to understand such intensely networked work, it is not enough to stand still and trace the minute and critical interactions that actors have

with the outside world and with each other. It is necessary to include this outside world. This is why workplaces studies, plural, makes more sense, we do not call it medium studies either: this is not just because the variety of media out there, but because of the way in which media are so often intertwined in sociomaterial assemblages, even more so in the digital age. The same is true of our workplaces.

For all their attention to detail, workplace studies of control rooms tend to portray them as rather sterile. Not only do they often reinforce the isolation of the control room, they also contribute to the largely immaculate reputation of control rooms. Contingencies are just challenges, eventually solved and the outside world—the organisation, particularly neoliberal managerialism—hardly ever spills over. It is telling that, despite decades of studies of air traffic control, the tensions between air traffic control operators and management that persistently seep into the popular press have hardly been covered by workplace studies. We had to wait several decades for an in-depth study of the labour dispute between air traffic control operators and the Federal Aviation Administration that raged in the 1970s and 1980s and led to the firing of 11,000 operators by the Reagan administration in 1981 (cf. Nordlund 1998). It seems no coincidence that it was ultimately Diane Vaughan, an organisational sociologist working in historical anthropology, who produced a monograph on the relationship between current practices and the labour history of US air traffic control. Ironically, workplace studies has a blind spot for labour disputes.

3. Theoretical contributions

Before and during the research I had no a priori theoretical ambitions. The key here is the order of things: theory follows observation. The method, not the theory, provides the framework. I have been able to make valuable contributions to practice theory by integrating sources of very different epistemological quality. The key is to treat everything as a field in the anthropological sense.

Mediatisation is a key concept that I have tried to rewire into a much more focused, empirically grounded concept in chapter two. As it turned out, it runs through the field historically, linking past and present. In chapter five, the detailed study of the present led to the conceptual development of different orderings and the mapping of their interplay. This can help future research to better conceptualise mediated mobility. But it also enriches our understanding of the past.

By acknowledging, as Wietschorke put it, the "epistemologischen Verklammerung von Geschichte und Gegenwart" (2012), I could travel between the present and past. It was only as I was writing these final pages that it occurred to me that perhaps the intimate ordering, the families living on board and then settling ashore, was a market ordering after all. In chapter one I described an early manifestation

of a four-step pattern: 1) economic growth tempts 2) a boom in shipbuilding, then 3) economic recession leads to 4) overcapacity. This is what brought families on board in the first place, selling their home on land in the late 19th century. Then, post-1945, compulsory education was essentially a regulatory ordering and stood at the beginning of the end of family life on board, as kids left the ship for school. In this way, this study takes a much more analytical look at the longue durée of inland navigation and the efforts made since the nineteenth century through media from the shore to organise transport on a daily basis. The two key publications on river infrastructuring in recent decades in the Netherlands, by Halma (2004) and Filarski (2014), are brought together in a new way by integrating them into the field and locating them in a power dynamic: one officially sanctioned, the other largely ignored.

Similarly, it took me a while to realise that another kind of order was also being maintained. There are many examples in this book of attempts to reproduce a mono-ethnic, even white, male ordering. On the one hand this is a widespread phenomenon in western European societies, but on the other hand it is also linked to the specifics of inland navigation. Here, it was mainly men who stayed on board, and who were able to observe societies that were often beyond their reach and onto which norms could easily be projected. These types could be seen as bordering—as quoted above, Schillmeier and Pohler added a "b"—as they are about who is allowed in and who is to remain "not one of us"—something for which rivers themselves are also used (cf. Thomas 2021). The control room is involved in various bordering practices, some of them quite unsubtle and racist, such as the episode with Malik described in chapter three. More generally, every control room has a territory—even nautical control rooms follow the terrestrial logic (cf. Steinberg and Peters 2015; Peters and Steinberg 2019) of a state. The way in which the control room in Dordrecht inserted itself into a national narrative and showed itself to be part of a system capable of monitoring whether *Sinterklaas* has already arrived from Spain, as the story goes every year, can be placed in the same category of bordering, although not with the same malicious intent as some other bordering practices.

This study not only offers a new perspective on the past and the present. The notion of 'media of separation'—to focus on the control of distance through media—can serve as a frame of reference for the increasing reliance on media in mobility. Mediated separation will increasingly be a key phenomenon to understand for geographers, sociologists and media scholars alike. The automation of cars and ships relies heavily on sensors, for which the assemblage of navigation is being rearranged. Current practices of maintaining safety margins need to be translated. In the near future, these automated processes will be monitored by humans who will have to intervene at any time. Furthermore, automated, sensor-based mobility will coexist with less automated separation practices. Keeping separate what would otherwise collide is also a communicative process. Giving and taking space, assessing

margins, ensuring minimal separation will be a hybrid practice, where some assemblies will still be dominated by humans, while in others we will be out of the loop, probably also depending on labour costs relative to other operating costs (the former being marginal for the largest ocean-going vessels).

In the early days of workplace studies in the 1990s, Lucy Suchman managed to bring together the first wave of control room studies under the concept of 'centres of coordination'. Since then, the concept has lost much of its coherence. This book aims to contribute to the return of a comparative perspective on mobility-oriented control rooms. Conceptually, this is also done by introducing 'rule-based traffic' and 'schedule-based traffic' as the outer ends of a scale.

I show that while media are involved in massive changes, a media revolution is nowhere to be found: whether it is the history of mediated control and the early history of nautical control rooms in the first chapter, the mediatisation of work in the second, the efforts to establish an alternative regime of representation as analysed in the third and fourth chapters, or the media of separation critical to the multiple orders disentangled in the fifth chapter. Instead, the media assemblage of the control room is as much a way of coping with change, a means of catching up, and thus a by-product as it is an instigator of change.

Yates showed how this worked for the organisation of transport and large companies in the form of communication through control in the 19th and early 20th century in the USA, a study that has been modestly replicated in the Netherlands by Ketelaar (2006). Otherwise, however, it has hardly been studied historically and ethnographically in Europe. Furthermore, this book takes into account the fact that the control room is often presented as revolutionary in public, in a quest for organisational legitimacy. This has allowed me to argue that this has had serious implications for the workplace and the work itself, and increasingly so. Control room work and its discursive reputation have been discussed in separate debates at the expense of a broader understanding.

This points to a challenge for the practice turn in media studies: the danger of throwing the baby out with the bath water. My background is in the Utrecht tradition of media studies: where the emphasis at the time was on materiality and discourse, often in a comparative and historical perspective. In Siegen, where the Graduate School Locating Media has funded most of this research, the focus is on practices, building on work in Science and Technology Studies. In this book I have been able to show where practice and visibility meet as symbolic power—through design, through visitor regimes, through sanctioned Twitter work—and then turned to the sociological literature on professions and organisations to better understand the intersection of practice and representation. This book therefore presents an approach that bridges the study of the promise and politics of infrastructure (cf. Larkin 2013) and the study of its practices, an approach that is on the rise (cf. Anand, Gupta, and Appel 2018; Schabacher 2022).

The final theoretical contribution of this book is made in the following section. As 2025 marks the 30th anniversary of Hutchins' seminal Cognition in the Wild, it is time to revisit navigation.[1]

4. Revisiting Cognition in the Wild

By bringing together detailed accounts of navigation at sea, in deltas and on rivers, I aim to reassert how navigation can be theorised. Navigation is a practice. Edwin Hutchins' book has long been, to use a common term in practice theory, an "obligatory passage point" (Callon 1986: 204) for a project like mine, although in the final part of this conclusion I argue that perhaps it should no longer be. I argue this primarily through two ethnographies of navigation, Laura Bear's *Navigating Austerity* (2015) and Penny McCall Howard's *Environment, Labour and Capitalism at Sea* (2017), in relation to my own fieldwork.

In chapter five, I could formulate that inland navigation is the repetition of three steps in ever-changing conditions: 1) separating hull-water-riverbed, 2) determining the current position, and 3) linking the current position with the near-future position. A picture emerged of skippers deeply enmeshed in sociomaterial assemblages. How does my analysis of navigation on the waterways of north-west Europe relate to other practical theoretical descriptions of nautical navigation? Hutchins' book shows a detailed understanding of collective practices. It reached many scholars, not least through the then emerging field of workplace studies, many of whom had little interest in nautical practices. Many referenced the book, including Lucy Suchman's seminal text "Centres of Coordination" (1997), but even when they were interested in mobility, it tended to be rail, air and urban mobility (cf. Harper and Hughes 1992; Heath and Luff 1992; Gras et al. 1994; Sanne 1999). It could therefore happen that Hutchins' book was perceived from the outside as the classic book on the subject, even though many people read it for other reasons. Having been recommended to me so often, I was surprised that the book proved to be of so little use during my studies of nautical mobility. Until I read Laura Bear's *Navigating Austerity* (2015), I thought it was mainly my fault, hoping that if I returned to the book at a later stage in my research, it would make sense to me. Laura Bear spent years doing fieldwork on the Hooghly. The Hooghly is an Indian river on which most goods from eastern India and Nepal must travel to reach the ports of Singapore and Colombo and then the rest of the world. It is only in her fifth chapter that Bear turns to the

1 Parts of this section appeared in 2022 in *Navigationen* under the title: "Mediatisierte Wahrnehmung, infrastrukturiertes Wasser, situiertes Wissen: Entwurf einer Praxistheorie der nautischen Navigation."

actual navigation, after taking the time to show how the political and economic history of the Hooghly has shaped the organisational and commercial dynamics that restrict, even threaten, navigation. Referring to Hutchins, she writes that "most forms of navigation cannot be understood by focusing solely on technical skill and utility" (131). Bear saves the actual point for a footnote, which I will quote in full:

> This makes Hutchins's analysis of navigation problematic: he focuses on a context for navigation that is purified of its usual contradictions—that is, the making of profit and manipulation of technical objects and data in relation to a recalcitrant world. It is only because he chooses such a context that his discussion of navigation can remain one about cognitive practices and devices. His contexts helps to produce his theory that ultimately technologies, including that of navigation, are simply part of a project of cognition, a human will to know certain things and achieve certain crystallizations of practical knowledge about the world. (216)

There is a lot going on here. A necessary first step is to look at the context that Hutchins has chosen by zooming in on the cues as to what happened to the 'usual contradictions' in Hutchins' field.

The US Navy was Hutchins' employer at the time, and as such most of the legitimising work to gain access had already been done. In this way, he overcame a triple challenge. Firstly, it is difficult to gain access to a workplace where the ongoing safety of many people is at stake. For the bridge of a seagoing vessel, more so than a control room; as we saw in chapter three, visits are built into its design. Secondly, the very mobility of a ship presents a challenge to the researcher wishing to conduct fieldwork on board, as it is difficult to leave the field once on board. Therefore, access must be granted for the duration of a voyage, or at least for a whole stage. In the case of shipping, this would mean living on board, using scarce resources, and being integrated into a closed community. Third, it is almost impossible for anthropologists to study military activity independently. Hutchins spent a total of 11 days on board over a period of 4 months (cf. 22). This does not seem much, as he admits (ibid.), but it is probably more than anyone else has ever got and can already produce a wealth of data. This is compounded by a common practice in workplace studies: making video recordings to be transcribed and studied in detail later.

One of Hutchins' recordings captures two crew members discussing Hutchins' presence on board. It is to Hutchins' credit that he included such a passage. The senior crew member said

> He's studying navigation on big ships. He's the guy, he makes computer programs for teaching stuff. Like they got a big computer program thing they use in ASW school to teach maneuvering boards. It's all computerized. He is the one that makes it. He is the one who makes things like that. He's a psychologist and an-

> thropologist. Works for the navy. He's a PhD. Makes all kinds of strange things. (23)

Apparently, the legitimacy of Hutchins's research lay in its perceived applied nature, in the fact that it tangibly changed conditions in the world of the people it observed. It is likely that such accounts of research follow the author's efforts to explain what the purpose of the research was. However, it is not mentioned how this was done, although in such a strictly hierarchical structure there may be fewer questions asked: Hutchins recorded more than one instance of crew members discussing the reasons for his presence, and in each case a senior officer explaining it to a subordinate. Hutchins in fact made explicit use of the hierarchical structure to fit in, and many of the crew members he interacted with "were also aware that I had lunched at least once in the captain's quarters, an honor reserved for visiting VIPs." (22) How this related to his ambition to be a "colleague and friend" (ibid.), while in the pilothouse "I tried not to participate, but only to observe" (25), remains unclear. So there is a context that has been left out, ignored. Moreover, he goes on to write that "[m]any aspects of the military culture go unreported here because I am not confident about their organization and meaning on the basis of such a short exposure." (25) So not only was the field that Hutchins chose "purified of contradictions" by the military organisation itself, as Bear wrote (as quoted above), but Hutchins himself deliberately chose to leave out quite a bit of context.

It is also because of the above that a 'purified' account of navigation could emerge. What could be seen as a detour in this respect—the kind of research (see chapters one to three) one does when one's presence is suspected and/or restricted—often becomes the basis for a new and provocative understanding of the field. Ultimately, Bear joins pilots on board seagoing vessels, but everything—the shape of the waterway, the pattern of traffic, the pressure on the pilots—only makes sense because she was 'parked' in an archive of the local maritime authority, which was thought to contain utterly meaningless documents, but which contained vital information. Like Hutchins, the mainstream publications on workplace studies begin with full access, drawing on ethnographic methods but largely concealing socialisation in the field and failing to adopt the reflexivity of the anthropological tradition. In this sense, it is not surprising that workplace studies as an academic field hardly covers (the everyday politics of) working conditions. An academic in a field called human factors, who specialises in maritime shipping and land-based traffic coordination, told me that he left out of his publications his only fieldwork on board a seagoing vessel because the data were "too messy", contaminated by complicated and "disturbing" social dynamics on board (Interview 17.7.18).

For Bear, the usual contradictions are rooted in "the making of profit and manipulation of technical objects and data in relation to a recalcitrant world." (216) Of course, the U.S. Navy is deeply embedded in global capitalism through the state that

funds it and whose (commercial) interests it protects, but perhaps this does not drive most decisions about navigating a ship as it does elsewhere. In Bear's work on the Hooghly, as in my own presented in this book, the drive to reduce costs and increase speed tends to trump everything else. In this quest, as I shall explain below, the shore plays a crucial role.

Every field its own question?

"Where am I?" should be the central question of navigation (Hutchins 1995: 12). Bear argues that there are actually two questions in navigation. The first is still Hutchins' question, but the second is "How can I make a profit in shortest amount of time?" (131). I have described how, in the case of inland navigation in Western Europe, the first question is a relatively casual one because of the familiarity with the confined riverine waterscape compared to the open sea.

In my field there is a question in between: where are the other ships? There are two ways of answering this question: the first relates to the continuous linkage between current position and near-future position, and is focused on avoiding collisions, a process I have described in detail in chapter five. The second way in which skippers answer this question is by locating their active competitors on the waterway, which is tied to the profit-making question Bear emphasises. This is illustrated by the episode discussed in section five of chapter five. There, a story told by the skipper and owner of the container ship *Sunrise* highlighted the pressure to know where others are whilst they know where you are (Field note 30.3.17). It showed that navigation is a mutually constitutive practice, both in direct passages and in decisions about speed or rest.

Penny McCall Howard has written an ethnography of navigation called *Environment, labour and capitalism at sea* (2017). She does not cite Bear, which is indicative of the fact that there is no scholarly debate about what navigation looks like in practice, apart from Micronesian navigation, which has received plenty of attention. There is no debate about Western navigation, writes McCall Howard (cf. 121–2), simply because it has hardly been studied ethnographically.

McCall Howard describes the practices of Scottish fishermen, into which she immersed herself completely. Even more so than Bear, she argues against Hutchins, as his "generalisations about Western navigation practices are like observing the walking practices of a US Army drill squad and using them to generalise about Western walking practices." (122) Interestingly, she found a snippet of organisational context in Hutchins' book that might explain the practices he observed differently. Hutchins quotes a navigator who says "You can go into San Diego by eye. But legally, you can't." (Hutchins quoted in McCall Howard 123) Thus she concludes that "[t]he elaborate navigation procedures Hutchins describes may be a greater reflection of the pro-

cesses of accountability within the US Navy and between the US Navy and American society as a whole, than they are about finding position at sea." (123)

She suggests rephrasing Hutchins' central question as 'where is that?' because she "did not observe anyone using a chart or digital plotter to orient themselves in the traditional sense of having to discover their position" (124). Like on the ships I joined, when McCall Howard saw a crew member emerge from below, they could often tell where they were. When sailing closer to the coast and around islands, there are often visual markers. McCall Howard makes it a relative question, which is a similar but more radical step than I have taken with my 'where are the others' question, in that it replaces Hutchins' question altogether. Her question is not only spatial but also temporal. The fishermen have invested in GPS chart plotters that show not only their current position but also their past course. One of her best examples is when she tries to tell another captain by radio frequency where they caught so much shrimp while she was at the helm. 'Where is that?' is about much more than GPS position, because the vessel is in one place, but the nets are somewhere else. Depth finders are just as important. In this case they are integrated in an assemblage not primarily aiming for minimum separation, as with Western European inland navigation, but seeking connection with the ground whenever the characteristics of the seabed afford this, though trawling is also done midwater.

Looking at McCall Howard's study—together with Bear's, one of the most important ethnographies of navigation to date—it is clear that navigation is a situated practice where the many local variables make it difficult to generalise. Navigation is a situated practice, and what needs to be situated is different. Pilots on the Hooghly navigate spatiotemporal tidal restrictions and the interplay of erosion and sedimentation in relation to the clearance under the keel. Inland waterway skippers navigate heavy traffic while trying to find just enough draft at lower water levels. In the case of fish and crustaceans, the constant and often complex problem is not to locate oneself, but to locate something else in relation to one's own position. Although there is a great deal of overlap in the critical variables that those at the helm have to take into account, they are prioritised differently in different fields.

Embodied navigation of risk

Here, I would like to highlight an element that persists in all of the fieldwork discussed above, and has also been identified in other relevant studies (cf. Pálsson 1994; Carse 2020): embodiment. In terms of skills, these are difficult to reduce to the level of the individual, as they are learned in communities of practice, and are often embedded in collectively performed tasks that require close coordination, as Hutchins and many other workplace studies since the 1990s have shown. Ashley Carse (2020) describes how Panama Canal pilots struggle to get a 'feel' for the new generation of giant ships, three times the size they are used to. In fact, all these studies, includ-

ing my own, show that the mediatisation of the wheelhouse, the digitisation of instruments and the automation of the helm do not make intangible, embodied skills redundant. Rather elegantly, McCall Howard describes how actors in the field have developed "techniques to extend the body and its senses" (89). Here she shows how feeling underwater through the cables of the nets, to "feel the depth" (95), is integrated into a whole range of sensory techniques, including new technologies such as GPS chartplotters. The trick is integrating oneself into this assemblage, to learn "how to anticipate, understand, deflect and control the motions, tensions and forces involved in working at sea instead of simply being subjected to them," thought the risk of "over-extension" always remains (100, 97).

Although markets rely on them, the risks of embodied labour are not usually borne by large commercial entities. In practice, this is experienced on board, where market orderings lead to risky navigational orderings, or where market orderings trump regulatory orderings, leading to personal risk. In the Hutchins study, it was already clear that these legal and financial risks remain an issue when returning to shore. Navigating into the port of San Diego with instruments, documenting every detail, is not only an expression of responsibility, but also of risk, as the same navigator is quoted as saying: "Boy, you better have everything covered here, because they are going to try to hang the captain. They will try to hang him. Unless he can prove with data that everything he did was right" (Hutchins 1995: 38). What he 'did' here is what others did under his watch, with his approval.

In *Navigating Austerity*, risk-taking is not an individual choice, but the result of systemic neglect and deficit, making the river an "austerity timespace" (Bear 2015: 130). As a pilot devastated by an accident blamed on him puts it: "You are dealing with the consequences of things that are destined to happen already before you start to do things." (ibid.) As for skill, Bear found that it is culturally linked to risk, since institutionally the "invocation of skill, individuality and the excitement of danger" dominates, while practically it means "the ability of a pilot to overcome the omissions and contradictions created by predictive technologies and work practices that tie together the conflicting rhythms of trade and capital generation on a recalcitrant river" (135). When things go wrong, official investigations only "determine if the pilot was at fault" (136), which is the flip side of what river pilots have internalised as their "heroic, individual agency" (140).

McCall Howard also encounters fishermen who have embraced risk as an individual quality, a test of character rather than market logic (189–191). However much risk was encouraged, the rewards went mostly to the owners, who were often not crew members; overall, she concludes that "exploitation is embodied in the social structure of fishing" (167). In practice, it meant that "constant pressure and competition encouraged poor vessel maintenance, boats staying out in bad weather, crew pushing past the limits of fatigue" (190). As was the case on the rivers where I conducted my fieldwork, the extreme "working hours led to crew exhaustion and falling

asleep at the wheel", although for fishermen, accidents seemed more likely: "It was not uncommon for boats to crash headlong into completely familiar rocks, cliffs and islands" (ibid.). Importantly, "[t[hese wrecks had nothing to do with navigation problems or being 'lost' – these boats would have passed these hazards hundreds of times before and known exactly where they were." (ibid.)

Navigating is infrastructuring

On the water, much more than with terrestrial logistics, the basis for mobility and thus for profit is to account for the fluctuations — tides, sedimentation and erosion, currents, height of waves, weather — as many of these cannot be stabilised. The Rhine seems to be the exception here, but centuries of infrastructural efforts were not enough when skippers encountered the extreme low water of 2018. Other major waterways such as the Mississippi or the Panama Canal face similar water shortages. Knowledge of critical variations is the basis for risk assessment. It allows Rhine skippers to push the limits of how much cargo they can carry, even if it is more than legally defined as safe at that particular water level. On the Hooghly, the state's efforts to better account for fluctuations allowed the minimum clearance between ship and riverbed to be reduced. Here it was the state that redefined the minimum clearance to allow more ships to pass through during a particular tidal window.

Knowing the margins the critical fluctuations allow and exploiting them during navigation is a matter of nautical media. This knowledge is not only provided by external public institutes, but is increasingly produced on board and between ships, so that there is a constant exchange of what is measured and detected. There are many informal processes in which this is done, in oral exchanges, but is also done via AIS, as discussed above, and through distributing the measuring and measured depths along the commercial fleet, as the Dutch state agency Rijkswaterstaat has introduced on the Rhine. Ultimately, this points to a fundamental feature of mobility, perhaps in general, but at least in sea and river navigation, to an interdependent, mutually constitutive logic in which traffic and infrastructure are immanent practices. There is no traffic a skipper has to navigate, but the joint organisation of passings is what makes traffic, by distributing shared space skippers are traffic. This seems rather obvious, but it is also true for infrastructure. Skippers do not use nautical infrastructure as if it were something external to them, but they are constantly infrastructuring by navigating: they have more influence on the shape of the waterway through the patterns of erosion and sedimentation their propellers (and nets) create as a result of the course they choose (which is more detailed than the institutionally defined shipping lane) than dredgers can keep up with. If navigation is based on defining one's position in relation to something else (ships, competitors, submerged rocks, sandbanks, shore, quay, shoals, nets, authorities, currents, weather

tides, etc.), the difficulty is that very few of these are stable. Acting on these definitions sets everything in motion again—drifting, evading, redirecting.

Literature

Abbott, A. 1981. "Status and Status Strain in the Professions." *American Journal of Sociology* 86 (4):819-35.

Abidin, C. 2020. "Somewhere Between Here and There: Negotiating Researcher Visibilility in a Digital Ethnography of the Influencer Industry." *Journal of Digital Social Research* 2 (1):56-76. https://doi.org/10.33621/jdsr.v2i1.20.

Abila, S.S., and L. Tang. 2014. "Trauma, post-trauma, and support in the shipping industry: The experience of Filipino seafarers after pirate attacks." *Marine Policy* 46:132-6.

Alkemade, W.J.A.v. 1941. "De Haven van Dordrecht." *Mensch en Maatschappij* XVIII:235-57.

Anand, N., A. Gupta, and H. Appel. 2018. *The Promise of Infrastructure*. Durham, NC: Duke University Press.

Anderson, B., and R. Gordon. 2017. "Government and the (Non)Event: The Promise of Control." *Social & Cultural Geography* 18 (2):158-77.

Anim-Addo, A., W. Hasty, and K. Peters. 2014. "The Mobilities of Ships and Shipped Mobilities." *Mobilities* 9 (3):337-49. https://doi.org/10.1080/17450101.2014.946773.

Arens, P., S. Hesper, K. Mutter, M. Schlünder, and A. Tammen. 2005. "Mit Ludwik Fleck in die Ambulanz des 21. Jahrhunderts: Ein Wörterbuch zur Einführung in die ambulanten Wissenschaften." In *Tatsache- Denkstil-Kontroverse. Auseinandersetzungen mit Ludwik Fleck*, edited by E. Egloff, 91–6. Zürich: Collegium Helveticum.

Arrondissementsingenieur. 1972. "Scheepvaartbegeleidings- en informatiepost te Dordrecht." NL-HaNA Nationaal Archief: ID 3.07.07, inv.nr. 1733.

Arrondissementsingenieur. 1973. "Huisvesting arrondissement Dordrecht." Rijkswaterstaat. NL-HaNA Nationaal Archief: ID 3.07.07, inv.nr. 702.

Atkinson, P., and D. Silverman. 1997. "Kundera's Immortality: The Interview Society and the Invention of the Self." *Qualitative Inquiry* 3 (3):304-25.

Bankoff, G. 2013. "The "English Lowlands" and the North Sea Basin System: A History of Shared Risk." *Environment and History* 19.

Bear, L. 2014. "For labour: Ajeet's accident and the ethics of technological fixes in time." *Journal of the Royal Anthropological Institute* 20 (S1):71-88.

Bear, L.. 2015. *Navigating Austerity: Currents of Debts Along a South Asian River*. Palo Alto: Stanford University Press.

Bender, C., and M. Zillinger. 2015. "Medienethnographie: Praxis und Methode." In *Handbuch der Medienethnographie*, edited by Cora Bender and Martin Zillinger. Berlin: Reimer.

Bender, H., and M. Kanderske. 2024. "Consumer Drone Warfare: Practices, Aesthetics and Discourses of Consumer Drones in the Russo-Ukrainian War." *Drones in Society: New Visual Aesthetics*, edited by E. Serafinelli, 145–59. London: Palgrave Macmillan.

Benedenrivieren, D. 1976a. "Verkeerspost Dordrecht." In *Publicaties MinIenM*. Dordrecht: Rijkswaterstaat.

Benedenrivieren, D. 1976b. "Verkeerspost Dordrecht." In, 38. Dordrecht: Rijkswaterstaat.

Beniger, J.R. 1989. *The Control Revolution: Technological and Economic Origins of the Information Society*. Cambridge, MA: Harvard University Press.

Bernhardt, C. 2016. *Im Spiegel des Wassers. Eine transnationale Umweltgeschichte des Oberrheins (1800–2000)*. Köln: Böhlau.

Blanning, T. 1983. *The French Revolution in Germany: Occupation and Resistance in the Rhineland*. Oxford: Oxford University Press.

Blok, S.I.E. 1968. "Vergadering van arrondissementsingenieurs der rivierarrondissementen." Rijkswaterstaat. Gelders Archief: 0377.185.

Boersma, A. 2018. "Mediatisation of Work: A History of Control Room Practice." *Zeitschrift für Kulturwissenschaften* 2:113-32.

Boersma, A. 2020. "Follow the Action: Understanding the Conflicting Temporalities of Ships, River, Authorities and Family Through Distributed Ethnography." *Mobilities*. https://doi.org/10.1080/17450101.2020.1823135.

Boersma, A. 2022. "Mediatisierte Wahrnehmung, infrastrukturiertes Wasser, situiertes Wissen: Entwurf einer Praxistheorie der nautischen Navigation." *Navigationen* 22 (1):93-115.

Boersma, F. 2020. RE: context video post Dordt 1996, 4.10.2020.

Bolter, D.J., and R. Grusin. 1999. *Remediation: Understanding New Media*. Cambridge: MIT Press.

Borbach, C. 2020. "Epistemologisches Reverse Engineering oder Über Technikheorie(n), Gilbert Simondon und das Echolot." In *Black Boxes – Versiegelungskontexte und Öffnungsversuche*, edited by Eckhard Geitz, Christian Vater and Silke Zimmer-Merkle, 227–52. Berlin: De Gruyter.

Borbach, C. 2024. *Delay – Mediengeschichten der Verzögerung, 1850–1950*. Bielefeld: transcript.

Bosch, A., and W.V.D. Ham. 1998. "Twee eeuwen Rijkswaterstaat (1798–1998)." Zaltbommel: Europese Bibliotheek.

Bosman, A. 1968. "Notulen van de riviermeestervergadering." Rijkswaterstaat. Gelders Archief: 0377.188.

Bouman, J. 2017. "Het sinistere Duivelseiland." In *AD de Dordtenaar*, 12. Dordrecht: Paul van den Bosch.

Bourdieu, P. 2004. "The Biographical Illusion." In *Identity: A Reader*, edited by Paul Du Gay, Jessica Evans and Peter Redman. London: Sage.

Bowker, G.C. 1995. "Second Nature Once Removed: Time, Space and Represenations." *Time & Society* 4 (1):47-66.

Braidotti, R. 2002. *Metamorphoses: Towards a Feminist Theory of Becoming*. Cambridge: Polity Press.

Brand de Boer, J., and W. Jonkman. 1990. *Militair gezag in Groningen: stad en provincie na de bevrijding, april-oktober 1945*. Assen: Uitgeverij van Gorcum.

Brand, N. 2011. "Waterways and towns' interest: The influence of Infrastructure on the urban pattern in Holland (1200–1560)." *OverHolland* 10/11:127-47.

Brand, N. 2012. "De wortels van de Randstad: Overheidsinvloed en stedelijke hiërarchie in het westen van Nederland tussen de 13de en 20ste eeuw." TU Delft.

Brink, E.A.B.J.T., and C.W.L. Schell. 1954. *Geschiedenis van de Rijkstelegraaf 1852–1902*. Den Haag: Staatsbedrijf der Posterijen, Telegrafie en Telefonie.

Brit, S. 1994. *In an Age of Experts: The Changing Role of Professionals in Politics and Public Life.* Princeton: Princeton University Press.

Bucher, T., and A. Helmond. 2017. "The Affordances of Social Media Platforms." *The SAGE Handbook of Social Media*, edited by J. Burgess, T. Poell and A. Marwick. London: SAGE Publications.

Büscher, M., M. Sheller, and D. Tyfield. 2016. "Mobility intersections: social research, social futures." *Mobilities* 11 (4):485-97.

Büscher, M., and J. Urry. 2009. "Mobile Methods and the Emperical." *European Journal of Social Theory* 12 (1):99-116.

Button, G. 1992. *Technology in Working Order: Studies of Work, Interaction, and Technology*. London: Routledge.

Callon, M., and J. Law. 1982. "On Interests and Their Transformation: Enrolment and Counter-Enrolment." *Social Studies of Science* 12 (4):615-25.

Callon, M. 1986. "Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay." *Power, Action and Belief: A New Sociology of Knowledge?*, edited by John Law, 196–223. London: Routledge.

Carse, A. 2012. "Nature as infrastructure: Making and managing the Panama Canal watershed." *Social Studies of Science* 0 (0):1-25. https://doi.org/10.1177/0306312712440166.

Carse, A. 2014. *Beyond the Big Ditch: Politics, Ecology, and Infrastructure at the Panama Canal*. Cambridge, MA: MIT Press.

Carse, A. 2020. "The Feel of 13,000 Containers: How Pilots Learn to Navigate Changing Logistical Environments." *Ethnos*. https://doi.org/10.1080/00141844.2019.1697337.

CBS. 2018. "Internationaliseringsmonitor 2018-I." CBS, Accessed 06–12-18. https://longreads.cbs.nl/im2018-1/executive-summary/.

Centen, T.J. 1972. "Notulen van de riviermeestervergadering." Gelders Archief: 0377.188.

Centen, T.J. 1975. "Notulen van de Riviermeestersvergadering." Gelders Archief: 0377.188.

Chandler, A.D. 1977. *The Visible Hand: The Revolution in American Buseiness*. Cambridge, MA: Belknap.

Cleveringa, P., J.P.C.A. Hendrinks, L.v. Beurden, H.J.T. Weerts, D.G. Smeerdijk, T. Meijer, H.d. Wolf, and D. Paalman. 2004. "'So grot overvlot der watere…' Een bijdrage aan het moderne multidisciplinaire onderzoek naar de St. Elisabethsvloeden en de periode die daaraan voorag ging." *Hollands Historisch Tijdschrift* 36:162-80.

Cohn, B.S. 1987. *An Anthropologist Among the Historians and Other Essays*. Dehli: Oxford University Press.

Coleman, L. 2014. "Infrastructure and Interpretation: Meters, Dams, and State Imagination in Scotland and India.' *American Ethnologist* 41 (3):457-72. https://doi.org/10.1111/amet.12084.

Coletta, C., L. Heaphy, S.-Y. Perng, and L. Waller. 2017. "Data-driven Cities? Digital Urbanism and its Proxies: Introduction." *Technoscienza* 8 (2):5-18.

Coletta, C., and R. Kitchin. 2017. "Algorhythmic Governance: Regulating the 'Heartbeat' of a City using the Internet of Things." *Big Data & Society* 0 (0):1-16.

Couldry, N., and A. Hepp. 2013. "Conceptualizing Mediatization: Contexts, Traditions, Arguments." *Communication Theory* 23:191-202.

Courant, D. 1910. "Uit Veendam wordt ons gemeld." In *Dordrechtsche Courant*. Dordrecht.

Courant, D. 1921. "Scheepstijdingen." In *Dordrechtsche Courant*. Dordrecht.

Courant, D. 1922. "Lijk gevonden." In *Dordrechtsche Courant*. Dordrecht.

Cremer, A. 1857. "Werdegang des Entwurfs und Baubericht." *Zeitschrift für Bauwesen* X/XII:503-8.

Dalen, J.L.v. 1931–1933. *Geschiedenis van Dordrecht*. Den Haag: Morks.

Dang-Anh, M., S. Pfeifer, C. Reisner, and L. Villioth. 2017. cMedienpraktiken: Situieren, erforschen, reflektieren. Eine Einleitung." *Navigationen* 17 (1):7-36.

Davin, A., and L. Parks. "An Introduction & Index to the Material." Accessed 9.11.19. http://www.historyworkshop.org.uk/the-history-workshop-archives-an-introduction/.

De Jong, M., and H. Stout. 2007. "The impact of government intervention in technological transitions: evidence from Dutch history." *Technology, Policy and Management* 7 (1):89-104.

De Landa, M. 1991. "War in the Age of Intelligent Machines." New York: Zone Books.

De Wit, W.O. 1998. "Telefonie in Nederland 1877–1940: Opkomst en ontwikkeling van een grootschalig technisch systeem." TU Delft.

Deane, C. 2015. "The Control Room: A Media Archeology." *Culture Machine* 16:1-34.

Deleuze, G., and F. Gauttari. 2010. *Nomadology: The War Machine*. Translated by Brian Massumi. Seattle: Wormwood Distribution.

Deleuze, G. 1992. "Postscript on Control Societies." *October* 59 (1):3-7.

Denicke, L. 2012. "Global/Airport. Zur Geopolitk des Luftverkehrs." Humboldt-Universität zu Berlin.

Denis, J., A. Mongili, and D. Pontille. 2015. "Maintenance & Repair in Science and Technology Studies." *Technoscienza* 6 (2):5-15.

Derman, J. 2011. "Carl Schmitt on Land and Sea." *History of European Ideas* 27 (2):181-9.

Directeur-generaal van de Rijkswaterstaat, l.D.-G. 1973. "Aanpassing organisatie." NL-HaNA Nationaal Archief: ID 3.07.07, inv.nr. 687–702.

Directeur-generaal van de Rijkswaterstaat, l.D.-G. 1976. "Voorzieningen steunpunt Dordrecht; principe-plan." NL-HaNA Nationaal Archief: ID 3.07.5019, inv.nr. 856.

Dordrecht, A. 1972. "Scheepvaartbegeleidings- en informatiepost." Rijkswaterstaat. NL-HaNA Nationaal Archief: ID 3.07.07, inv.nr. 1733.

Edwards, P.N. 1996. *The Closed World: Computers and Discourse in Cold War America*. Cambridge, MA: MIT Press.

Eijk, T.L.v. 1981. "Reserveweek in dienstroosters." NL-HaNA Nationaal Archief: ID 3.07.07, inv.nr. 503–507.

Ellis, B.A. 2018. "Trapped on Love Boat: Middling and Transient Entrapment among Balkan Seafarers in the Cruise Industry." *Border Crossing* 8 (2):393-408.

Evans-Pritchard, E.E. 1962. "Anthropology and History." In *Social Anthropology and Other Essays*, edited by E.E. Evans-Pritchard. New York: The Free Press of Glencoe.

Evans-Pritchard, E.E. 1976. *Witchcraft, Oracles, and Magic among the Azande.* Oxford: Clarendon.

FAA. 2019. "First Air Traffic Controller Remembered." Accessed 16.2.2019. https://www.faa.gov/news/communications/controller_remembered/.

Farrell, C., and J. Morris. 2003. "The 'Neo-Bureaucratic' State: Professionals, Managers and Professional Managers in Schools, General Practices and Social Work." *Organization* 10 (1):129-56.

Fassin, D. 2013. *Enforcing Order: An Ethnography of Urban Policing*. Cambridge, UK: Polity Press.

Favier, R., and A.-M. Granet-Abisset. 2009. "Society and Natural Risks in France, 1500–2000: Changing Historical Perspectives." In *Natural Disasters, Cultural Responses. Case Studies Toward a Global Environmental History*, edited by C. Mauch and C. Pfister: 103–36. Lanham, MD: Lexington Books.

Fielding, N.G. 1994. "Cop Canteen Culture." In *Just Boys Doing Business: Men, Masculinity and Crime.* edited by T. Newburn and E. Stanko. London: Routledge.

Filarski, R. 1995. "Kanalen van Koning-Koopman. Goederenvervoer, binnenscheepvaart en kanalenbouw in Nederland en België in de eerste helft van de negentiende eeuw." University of Amsterdam.

Filarski, R. 2014. Tegen de stroom in: Binnenvaart en vaarwegen vanaf 1800. Utrecht: Uitgeverij Matrijs.

Filarski, R.. 2017. RE: gesprek, 4.12.2017.

Filarski, R., and G.P.A. Mom. 2008a. *Van transport naar mobiliteit: de mobiliteitsexplosie (1895–2005)*. Zutphen: Walburg Pers.

Filarski, R. 2008b. *Van transport naar mobiliteit: de transportrevolutie (1800–1900*). Zutphen: Walburg Pers.

Filippi, G., and J. Theureau. 1993. "Analyzing Cooperative Work in an Urban Traffic Control Room for the Design of a Coordination Support System." In *Proceedings of the Third European Conference on Computer-Supported Cooperative Work*, edited by G. Michelis, C. Simone and K. Schmidt, 171–86. Milan: Kluwer.

Fleck, L. 1935/1981. *Genesis and Development of a Scientific Fact.* Chicago: University of Chicago Press.

Flichy, P. 1995. *Dynamics of Modern Communication: The Shaping and Impact of New Communication Technologies*. Thousand Oaks, CA: Sage.

Flichy, P. 2006. "New Media History." In *Handbook of New Media*, edited by Leah A. Liehvrouw and Sonia Livingstone, 187–204. London: Sage.

Freidson, E. 1994. *Professionalism Reborn*. Cambridge: Polity.

Frijhoff, W., H.P.H. Nusteling, J.v. Herwaarden, and M. Spies. 2000. *Geschiedenis van Dordrecht 1813 tot 2000*. Hilversom: Uitgeverij Verloren.

Garfinkel, H. 1967. *Studies in Ethnomethodology*. New Jersey: Prentice-Hall.

Geertz, C. 1988. *Works and Lives: The Anthropologist as Author.* Standford: Stanford University Press.

Gekker, A., and S. Hind. 2016. "'Outsmarting Traffic, Together': Driving as Scoial Navigation." In *Playful Mapping in the Digital Age*, edited by Playful Mapping Collective. Amsterdam: Institute for Network Cultures.

Gherardi, S. 2018. "Practices and Knowledges." *Teoria e Prática em Administração* 8 (2):33-59.

Gibson, J.J. 1978. "The Ecological Approach to the Visual Perception of Pictures." *Leonard* 11:227/35.

Gilbert, G.A. 1973. "Historical Development of the Air Traffic Control System." *IEEE Transactions on Communications* 21 (5):364-75.

Gottschalk, M.K.E. 1971–1977. *Stormvloeden en rivieroverstromingen in Nederland – Strom Sruges and River Floods in the Netherlands*. 3 vols. Vol. 1. Assen: Van Gorcum & Company.

Graeber, D. 2015a. *The Utopia of Rules: On Technology, Stupidity, and the Secret Joys of Bureaucracy*. Brooklyn: Melville House.

Graeber, D. 2015b. "Anthropology and the Rise of the Professional-Managerial Class." *Hau: Journal of Ethnographic Theory* 4 (3):73-88.

Gregory, D. 2012. "From a View to a Kill: Drones and Late Modern War." *Theory, Culture & Society* 28 (7–8). https://doi.org/10.1177/0263276411423027.

Gregson, N. 2018. "Mobilities mobile work and habitation truck drivers and the crisis in occupational auto mobility in the UK." *Mobilities* 13 (3):291-307. https://doi.org/10.1080/17450101.2017.1343987.

Halma, G. 2004. *Het Verleden als Bouwsteen van het Heden: van Radardienst tot VTS, een overzicht van vijftig jaar verkeersbegeleiding vanaf de wal, in Nederland*. Hoek van Holland: Magneet Grafiche Communicatie B.V.

Harcourt, B.E. 2002. *Illusion of Order: The False Promise of Broken Windows Policing*. Cambridge: Harvard University Press.

Harper, R., and J. Hughes. 1992. "What a f—ing system! Send 'em all to the same place and then expect us to stop 'em hitting. Managing technology work in air traffic control." In *Technology in Working Order: Studies of Work, Interaction, and Technology*, edited by Graham Button, 127–44. London: Routledge.

Harper, R., J. Hughes, D. Randall, D. Shapiro, and W. Sharrock. 1997. *Ordering the skies: Sociology, CSCW, and air traffic control*. London: Routledge.

Heath, C., and P. Luff. 1992. "Collaboration and Control: Crisis Management and Multimedia Technology in London Underground Line Control Rooms." *Computer Supported Cooperative Work* 1:69-94.

Heath, C., and P. Luff. 2004. *Technology in Action*. Cambridge: Cambridge University Press.

Heezik, A.v. 2007. *Strijd om de rivieren. 200 jaar rivierenbeleid in Nederland of de opkomst en ondergang van het streven naar de normale rivier.* Den Haag/Haarlem: HNT Historische producties.

Helmreich, S. 2019. "Reading a Wave Buoy." *Science, Technology, & Human Values*:1-25. https://doi.org/10.1177/0162243919856095.

Hemsbergen, M.v. 1984. "Camera's en radar beveiligen scheepvaartknooppunten." In *De Zwijndrechtse Kombinatie*, 21.

Hind, S., and A. Gekker. 2022. "Automotive parasitism: Examining Mobileye's 'car-agnostic' platformisation." *New Media & Society* 26 (7). https://doi.org/10.1177/1461444822110 42.

Holland. 2018. "The Netherlands: A trading nation." Rijksoverheid, Accessed 09–12-18. https://www.hollandtradeandinvest.com/feature-stories/the-netherlands-a-trading-nation.

Hoofdingenieur-Direkteur. 1979. "Bekendmaking aan de scheepvaart." In *Nr. 3/1979*, Rijkswaterstaat. Dordrecht: Private Archive.

Hueck, H., and R. Went. 2018. "Vijf mythes over handel en de toekomst van Nederland als handelsland" FTM, Accessed 08–12-18. https://www.ftm.nl/artikelen/vijf-mythes-handel-en-toekomst-nederland-als-handelsland?share=1.

Huhtamo, E. 1997. "From Kaleidoscomaniac to Cybernerd: Towards an Archeology of the Media." *Leonardo* 30 (3):221-4.

Hutchins, E. 1995. *Cognition in the Wild*. Cambridge: MIT Press.

IMO. 2008. "Guidance on near-misses reporting." MSC-MEPC.7/Circ.7.

Ingold, T. 2000. *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill*. London: Routledge.

Ingold, T. 2014. "That's enough about ethnography!" *Hau: Journal of Ethnographic Theory* 4 (1) (383–395).

Ingold, T. 2017. "Anthropology contra ethnography." *Hau: Journal of Ethnographic Theory* 7 (1):21-6.

Jensen, H.-J., and M. Oldenburg. 2019. "Potentially traumatic experiences of seafarers." *Journal of Occupational Medicine and Toxicology*. https://doi.org/10.1186/s12995-019-0238-9.

Jowsey, T. 2016. "Watering down ethnography." *BMJ Quality & Safety* 25 (7):554-5. https://doi.org/10.1136/bmjqs-2015-005062.

Jue, M. 2020. *Wild Blue Media: Thinking Through Seawater.* Durham: Duke.

Kaschuba, W. 2003. *Einführung in die Europäische Ethnologie*. München: C.H. Beck Verlag.

Ketelaar, E. 2006. ""Control through Communication" in Comparative Perspective." *Archivaria* 60:71-89.

Kittler, F.A. 1999. *Gramophone, Film, Typewriter*. Stanford: Stanford University Press.

Koehler, E. 2018. "The Netherlands Compared." The Hague: Netherlands Ministry of Foreign Affairs.

Korn, M., W. Reissmann, T. Röhl, and D. Sittler. 2019. *Infrastructuring Publics*. Wiesbaden: Springer.

Koster, P. 2020. "Dit stukje Nederland is drukst bevaren punt van Europa: 'Je ziet echt van alles voorbij komen'." AD, Accessed 16.6.20. https://www.ad.nl/dordrecht/dit-stukje-nederland-is-drukst-bevaren-punt-van-europa-je-ziet-echt-van-alles-voorbij-komen-br~a7cab30e/?utm_source=twitter&utm_medium=social&utm_campaign=socialsharing_web.

Krause, F. 2016. ""One Man's Flood Defense is Another Man's Flood": Relating Through Water Flows in Glaucestershire, England." *Society & Natural Resources* 29:681-95.

Krause, F. 2017. "Towards an Amphibious Anthropology of Delta Life." *Human Ecology* 45:403-8.

Krotz, F. 2017. "Mediatisierung: Ein Forschungskonzept." In *Mediatisierung als Metaprozess*, edited by F. Krotz, C. Despotović and M.M. Kruse, 13–32. Wiesbaden: Springer.

Krotz, F., and A. Hepp. 2013. "A Concretization of Mediatization: How Mediatization Works and Why 'Mediatized Worlds' are a Helpful Concept for Empirical Mediatization Research." *Empedocles. European Journal for the Philosophy of Communication* 3 (2):119-34.

Kuyenhoven, F. 2018. "Duivelseiland." Oneindig Noord-Holland, Accessed 15.12.18. https://onh.nl/verhaal/duivelseiland.

Lagendijk, V. 2016. "Europe's Rhine Power: Connection, Borders, and Flows." *Water History* 8:23-39.

Lambert, N.A. 2005. "Strategic Command and Control for Maneuver Warfare: Creation of the Royal Navy's "War Room" System, 1905–1915." *Journal of Military History* 69:361-410.

Latour, B. 1993. *We Have Never Been Modern*. Cambridge, MA: Harvard University Press.

Latour, B. 1999. "Circulating Reference: Sampling the Soil in the Amazon Forest." In *Pandora's Hope: Essays on the Reality of Science Studies*. Cambridge, MA: Harvard University Press.

Latour, B. 2004. "From Realpolitik to Dingpolitik: or How to Make Things Public." In *Making Things Public-Atmospheres of Democracy*, edited by Bruno Latour and Peter Weibel, 4–33. Cambridge MA: MIT Press.

Latour, B. 2007. *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford: Oxford University Press.

Latour, B., and E. Hermant. "Paris: Invisible City." Accessed 15.4.2017. http://www.bruno-latour.fr/virtual/EN/index.html.

Lave, J. 1991. "Situated Learning in Communities of Practice." In *Perspectives on Socially Shared Cognition*, edited by Lauren B. Resnick, John M. Levine and Stephanie Teasley, 63–82. Washington, D.C.: American Psychological Association.

Lee, J.J.v.d. 1973. "Zeer geachte heer Minister." NL-HaNA Nationaal Archief: ID 3.07.07, inv. nr. 687–702.

Leenders, K.A.H.W. 2004. "De interactie tussen mens en natuur in de strijd om land en water in het zuiden van Holland, 1200–1650." *Hollands Historisch Tijdschrift* 36:142-61.

Levenbach, M.O. 1981. "Van onze zusterorganisatie de Vervoersbonden FNV." In. NL-HaNA Nationaal Archief: ID 3.07.07, inv.nr. 503–507.

Lindqvist, S. 1979. "Dig Where You Stand." *Oral History* 7 (2):24-30.

Linton, J. 2010. *What is Water? The History of a Modern Abstraction*. Vancouver: UBC Press.

Lintsen, H. 1980. *Ingenieurs in Nederland in de negentiende eeuw: een streven naar erkenning en macht.* Den Haag: Nijhoff.

Lintsen, H. 2002. "Two Centuries of Central Water Management in the Netherlands. Technology and Culture." *Technology and Culture* 43 (3):549-68.

Loos, J. "Duivelseiland, hebben wij er ook een." Mokums.nl, Accessed 14.12.18. http://www.mokums.nl/duivelseiland.html.

Lynch, M. 2009. "Ethnomethodology and History: Documents and the Production of History." *Ethnographic Studies* 11 (Autumn):87-106.

Maasbode. 1917. "Brand." *Maasbode*. Rotterdam.

MacIntyre, A. 1967. "Myth." In *Encyclopedia of Philosophy*, edited by Paul Edwards. New York: Collier-Macmillan.

MacKenzie, D., and G. Spinardi. 1995. "Tacit Knowledge, Weapons Design, and the Uninvention of Nuclear Weapons." *American Journal of Sociology* 101 (1):44-99.

Marres, N. 2015. "Why Map Issues? On Controversy Analysis as a Digital Method." *Science, Technology, & Human Values* 40 (5). https://doi.org/10.1177/0162243915574602.

Mattern, S. 2015. "Mission Control: A Hisotry of the Urban Dashboard." *Places*.

May, J., and N. Thrift. 2001. "Introduction." In *TimeSpace: Geographies of Temporality*, edited by Jon May and Nigel Thrift. London: Routledge.

McCall Howard, P. 2017. *Environment, Labour and Capitalism at Sea*. Manchester: Manchester University Press.

McGranahan, C. 2018. "Ethnography Beyond Method: The Importance of an Ethnographic Sensibility." *Sites* 15 (1). https://doi.org/10.11157/sites-id373.

McLean, S. 2011. "BLACK GOO: Forceful Encounters with Matter in Europe's Muddy Margins." *Cultural Anthropology* 26:589-619.

McLuhan, M. 1954. "Notes on the Media as Art Forms." *Explorations. Studies in Culture and Communication* 2:6-13.

McLuhan, M. 1964. *Understanding media: The extensions of man*. Cambridge, MA: MIT Press.

Meer, K.V.d. 1999. *Verkeerspost Nijmegen: Voorlopig Ontwerp.* Groningen.

Méliès, G. 1899. "L'affaire Dreyfus." by Georges Méliès. Paris: Star Film Company.

Metze, M. 2009. *Veranderend getij*. Amsterdam: Balans.

Metzger, M.J. 2017. "Broadcasting versus Narrowcasting: Do Mass Media Exist in the Twenty-First Century?" In *The Oxford Handbook of Political Communication*, edited by K. Kenski and K. Hall Jamieson. Oxford: Oxford University Press.

MGR. 1996. "Regionale Verkeers Centrale Dordrecht gemoderniseerd." *De Scheepvaartskrant* (5.3.1996):31.

Morita, A. 2016. "Infrastructuring Amphibious Space: The Interplay of Aquatic and Terrestrial Infrastructures in the Chao Phraya Delta in Thailand." *Science as Culture* 25:117-40.

Morozov, E. 2013. *To Save Everything, Click Here: The Folly of Technological Solutionism*. New York: PublicAffairs.

Mumford, L. 1970. *The Pentagon of Power: The Myth of the Machine.* New York: Harcourt Brace Jovanovich.

N.R.C. 1970. "Verbetering Dordtse Kil is net begonnen." In *NRC Handelsblad*, 1. Rotterdam.

Nanz, T. 2016. "Zimmer mit kolossaler Aussicht: War Rooms als imaginäre Aushandlungsorte von Störungen." *Behemoth* 9 (1):38-57.

Neubert, C. 2018. "Empirie des Gebrauchs: Zur Praxis architektonischer Erfahrung in einem Kunstmuseum." In *Architektur im Gebrauch: Gebaute Umwelt als Lebenswelt*, edited by Sabine Ammon, Christoph Baumberger, Christine Neubert and Constanze A. Petrow. Berlin: Universitätsverlag der TU Berlin.

Nienhuis, P.H. 2008. *Environmental History of the Rhine-Meuse Delta: An Ecological Story on Evolving Human-Environmental Relations Coping with Climate Change and Sea-level Rise.* Dordrecht: Springer.

Noble, D.F. 1977. *America by Design: Science, Technology, and the Rise of Corporate Capitalism*. New York: Alfred A. Knopf.

Noordegraaf, M. 2007. "From Pure to Hybrid Professionalism. Present-day Professionalism in Ambiguous Public Domains." *Administration & Society* 39 (6):761-85.

Noordegraaf, M., and W. Schinkel. 2011. "Professional Capital Contested: A Bourdieusian Analysis of Conflicts between Professionals and Managers." *Comparative Sociology* 10 (97–125).

Nordlund, W.J. 1998. *Silent Skies: The Air Traffic Controllers' Strike.* Westport, CT: Praeger.

Otto, F. 2017. "Attribution of Weather and Climate Events." *Annual Review of Environment and Resources* 42:627-46.

Pálsson, G. 1994. "Enskilment at Sea." *Man* 29 (4):901-27.

Parks, L. "History Workshop 1." Accessed 1.11.19. http://www.historyworksho.org.uk/history-workshop-1/.

Parre, H.v.d., and H.-W. Hofs. 2015. "Veiligheid op rivieren in gevaar." NOS, Accessed 15.2.2015. https://nos.nl/artikel/2019508-veiligheid-op-rivieren-in-gevaar.html.

Passmann, J. 2016. "Was war Twitter? Eine Medien-Ethnographie." Universität Siegen.

Passmann, J. 2018. *Die soziale Logik des Likes: Eine Twitter-Ethnografie*. Frankfurt: Campus.

Passmann, J. 2019. "Less Mutable, More Mobile: The Role of Twitter Apps in the History of the Retweet Button." *Computional Culture* 7 (21.10.2019). http://computationalculture.net/less-mutable-more-mobile-the-role-of-twitter-apps-in-the-history-of-the-retweet-button/.

Peldszus, R. 2021. "Architectures of Command: The Dual-Use Legacy of Mission Control Centers." *Militarizing Outer Space: Astroculture, Dystopia and the Cold War*, edited by Alexander C. T. Geppert, Daniel Brandau and Tilmann Siebeneichner, 285–312. London: Palgrave Macmillan.

Peters, K., and P. Steinberg. 2019. "The ocean in excess: Towards a more-than-wet ontology." *Dialogues in Human Geography*. https://doi.org/10.1177/2043820619872886.

Plotnick, R. 2017. "Force, flatness and touch without feeling: Thinking historically about haptics and buttons." *New Media & Society* 19 (10). https://doi.org/10.1177/1461444817717510.

Portelli, A. 1981. "The Pecularities of Oral History." *History Workshop Journal* 12 (1):96-107.

Potthast, J. 2007. *Die Bodenhaftung der Netzwerkgesellschaft. Eine Ethnografie von Pannen an Großflughäfen*. Bielefeld: transcript.

Potthast, J. 2008. "Ethnography of a Paper Strip: The Production of Air Safety." *Sciene, Tehcnology & Innovation Studies* 4 (1):47-68.

Potthast, J. 2011. "Sense and Security: A Comparative View on Access Control at Airports." *Science, Technology & Innovation Studies* 7 (1):87-106.

Ramaekers, P. 2018. "Duitsland belangrijkste handelspartner van 17 EU-landen." CBS, Accessed 12–12-18. https://www.cbs.nl/nl-nl/nieuws/2012/31/duitsland-belangrijkste-handelspartner-van-17-eu-landen.

Ramella, A.L. 2018a. "Deciphering Movement and Stasis: Touring Musicians and their Ambivalent Imaginings of Home and Belonging." *Int. J. Tourism Anthropology* 6 (4):323-39.

Ramella, A.L. 2018b. "Finding One's Rhythm: A 'Tour de Force' of Fieldwork on the Road with a Band." In *Experimental Collaborations: Ethnography through Fieldwork Devices*, edited by A. Estralella and T. Sánchez Caido, 71–93. New York: Berghahn.

Ramella, A.L. 2021. *Mit Bands auf Tour: Eine Medienethnographie des Unterwegsseins*. Bielefeld: transcript.

Reichertz, J. 1992. "Über das Schrottplatzdenken: Zur systematik kriminalpolizeilichen Arbeitens." In *Polizei vor Ort: Studien zur empirischen Polizeiforschung*, edited by Jo Reichertz and Norbert Schröer, 137–54. Stuttgart: Ferdinand Enke Verlag.

Ribes, D. 2014. "Ethnography of Scaling: Or, How to Fit a National Research Infrastructure in the Room." Paper presented at the 17th ACM conference on Computer supported cooperative work & social computing, Baltimore.

Rijkswaterstaat. "Rijkswaterstaat pakt kruising Hollandsch Diep met Dordtsche Kil aan." Varen doe je samen, Accessed 18.10.2019. https://www.varendoejesamen.nl/kenniscentrum/artikel/rijkswaterstaat-pakt-kruising-hollandsch-diep-met-dordtsche-kil-aan.

Roberts, S.E., D. Nielsen, A. Kotłowski, and B. Jaremin. 2014. "Fatal accidents and injuries among merchant seafarers worldwide." *Occupational Medicine* 64:259-66.

Röhl, T. 2019. "Making Failure Public: Communicating Breakdowns of Public Infrastructures." In *Infrastructuring Publics*, edited by M. Korn, W. Reissmann, T. Röhl and D. Sittler. Wiesbaden: Springer.

Rolph. "Nieuwe #Botlekbrug" Twitter, Accessed 22.05.2016

Rolph. "@Rijkswaterstaat heeft maatregelen genomen." Twitter, Accessed 26.5.2017. https://twitter.com/vlw_rolph/status/868018348231208960.

Rolph. "Afgelopen dinsdag 9 juni zijn wij om 15.00u operationeel gegaan met onze nieuwe verkeerscentrale #Dordrecht. Hier een leuk filmpje!" Twitter, Accessed 12.6.2020. https://twitter.com/VLW_Rolph/status/1271458495699787776.

Rose, G. 1981. "Strategy of prevention: lessons from cardiovascular disease." *British Medical Journal* 282 (1847–51).

Sabetta, L. 2019. "Self-Defeating Prophecies: When Sociology Really Matters." In *Anticipation, Agency and Complexity. Anticipation Science, vol 4*, edited by R. Poli and M. Valerio. Cham: Springer.

Samuel, R. 1981. "History Workshop, 1966–80." In *People's History and Socialist Theory*, edited by Raphael Samuel. London: Routledge.

Sanne, J.M. 1999. *Creating Safety in Air Traffic Control.* Lund: Arkiv.

Schaap, D. 2002. *Onrust: het Nederlandse Duivelseiland*. Amsterdam: Bruna.

Schabacher, G. 2013. "Mobilizing Transport: Media, Actor-worlds, and Infrastructure." *Transfers* 3 (1):75-95.

Schabacher, G. 2022. *Infrastruktur-Arbeit: Kulturtechniken und Zeitlichkeit der Erhaltung*. Berlin: Kadmos.

Schabacher, G., and S. Spallinger. 2023. "Tests als Medien der Gewöhnung. Pilotversuche am Bahnhof." *Zeitschrift für Medienwissenschaft* 15 (29):35-50.

Schiermeier, Q. 2018. "Droughts, heatwaves and floods: How to tell when climate change is to blame." *Nature* 560:20-2.

Schilbrack, K. 2002. "Introduction: On the Use of Philosophy in the Study of Myths." In *Thinking Through Myths: Philosophical Perspectives*, edited by Kevin Schilbrack, 1–17. London: Routledge.

Schinkel, W. 2019. "Forgetting Memory: Memory and History in 'Smart Cities'." *Beyond Smart Cities Today Conference: Centre for BOLD Cities, Rotterdam*.

Schinkel, W., and M. Noordegraaf. 2011. "Professionalism as Symbolic Capital: Materials for a Bourdieusian Theory of Professionalism." *Comparative Sociology* 10:67-96.

Schlosser, E. 2013. *Command and Control: Nuclear Weapons, the Damascus Accident, and the Illusion of Safety.* New York: Penguin Books.

Schmitt, C. 2015. *Land and Sea: A World-historical Meditation*. Candor, NY: Telos Press Publishing.

Schot, J.W., H.W. Lintsen, and A. Rip. 1998. "Betwiste modernisering." In *Techniek in Nederland in de twintigste eeuw*, edited by J.W. Schot, H.W. Lintsen and A. Rip. Zutphen: Walburg pers.

Schubert, C., and T. Röhl. 2017. "Ethnography and organisations: materiality and change as methodological challenges." *Qualitative Research*. https://doi.org/10.1177/1468794117744748.

Schüttpelz, E. 2017. "Hunter into Prey: Trying to Make Sense of the "Media Revolution" at Göbekli Tepe." *Working Paper Series* (1):1-12.

Schüttpelz, E., and C. Meyer. 2018. "Charles Goodwin's Co-Operative Action." *Media in Action* 1 (1):171-88.

Secretaris, D. 1973. "Notulen van de riviermeestervergadering." Gelders Archief: 0377.188.

Sharma, S. 2014. *In the Meantime: Temporality and Cultural Politics.* Durham: Duke University Press.

Sheller, M., and J. Urry. 2006. "The new mobilities paradigm." *Environment and Planning A* 38:207-26. https://doi.org/10.1068/a37268.

Sijbesma. 1969. "Notulen van de veradering van arrondissementsingeneiurs der rivierarrondissementen." In. Gelders Archief: 0377.185.

Silvast, A., and M.J. Virtanen. 2014. "Keeping Systems at Work: Electricity Infrastructure from Control Rooms to Household Practices." *Science & Technology Studies* 27 (2):93-114.

Silverman, D. 2017. "How was it for you? The Interview Society and the irresistible rise of the (poorly analyzed) interview." *Qualitative Research* 17 (2):144-58.

Smith, G.J.D. 2004. "Behind the Screens: Examining Constructions of Deviance and Informal Practices among CCTV Control Room Operators in the UK." *Surveillance & Society* 2 (2/3):376-95.

Snyder, B.H. 2016. *The Disrupted Workplace: Time and the Moral Order of Flexible Capitalism*. Oxford: Oxford University Press.

Sontag, S. 1977. *On Photography*. London: Penguin.

Spaulding, R.M. 1999. "Anarchy, Hegemony, Cooperation: International Control of the Rhine River, 1789–1848." In *Consortium on Revolutionary Europe: 1750–1850*. Charleston SC.

Spaulding, R.M. "The Modern Bequest of a Dying Empire: The Rise of Joint Management of the Rhine River." Accessed 14.12.18. www.ccr.zkr.org.

Spaulding, R.M. 2018. "The Central Commission for the Navigation of the Rhine and European Media, 1815–1848." In *International Organizations and the Media in the Nineteenth and Twentieth Centuries: Exorbitant Expectations*, edited by Jonas Brendebach, Martin Herzer and Heidi J.S. Tworek, 17–37. London: Routledge.

Star, S.L. 1999. "The Ethnography of Infrastructure." *American Behavioral Scientist* 42 (3):377-91.

Star, S.L., and G.C. Bowker. 2006. "How to Infrastructure." In *Handbook of New Media*, edited by Leah A. & Sonia Livingstone Liehvrouw, 230–45. London: Sage Publications.

Stavorinus, J.S. 1797. *Reize van Zeeland over de Kaap de Goede Hoop, en Batavia, naar Samarang, Macasser, Amboina, Suratte, enz.* Leiden: A. & J. Honkoop.

Steinberg, P.E. 2013. "Of Other Seas: Metaphors and Materialities in Maritime Regions." *Atlantic Studies* 10 (2):156-69.

Steinberg, P., and K. Peters. 2015. "Wet ontologies, fluid spaces: giving depth to volume through oceanic thinking." *Environment and Planning D: Society and Space* 33 (2):247-64.

Stender, M. 2017. "Towards an Architectural Anthropology: What Architects can Learn from Anthropology and vice versa." *Architectural Theory Review* 21 (1):27-43.

Sterling, C.H. 2008. "Introduction." In *Military Communications: From Ancient Times to the 21st Century*, edited by Christopher Sterling. Santa Barbara, CA: ABC-CLIO.

Stoppelenburg, K. 1981. "Twaalfde bijeenkomst Beheerscomissie." NL-HaNA Nationaal Archief: ID 3.07.07, inv.nr. 243–245.

Stuulen. 1965. "Bespreking van rivierenigenieurs." Gelders Archief: 0377.185.

Stuulen. 1967. "Vergadering van rivieringenieurs." Gelders Archief: 0377.185.

Suchman, L. 1993. "Technologies of Accountability: Of Lizards and Aeroplanes." In *Technology in Working Order: Studies of Work, Interaction, and Technology*, edited by Graham Button, 113–26. London: Routledge.

Suchman, L. 1995. "Making Work Visible." *Communications of the ACM* 38 (9):56-64.

Suchman, L. 1997. "Centers of Coordination: A Case and Some Themes." In *Discourse, Tools and Reasoning: Essays on Situated Cognition.*, edited by Lauren B. Resnick, R. Säljö, C. Pontecorvo and B. Burge, 41–62. Berlin: Springer-Verlag.

Suchman, L., i.c.w.D. Gerst, and H. Krämer. 2019. "'If You Want to Understand the Big Issues, You need to Understand the Everyday Practices That Constitute Them'." *Forum: Qualitative Social Research* 20 (2):19p. https://doi.org/10.17169/fqs-%v.%i.3252.

Taylor, R.K., and D.A. Lucas. 1991. "Signals passed at danger: Near miss reporting from a railway perspective." In *Near Miss Reporting As a Safety Tool*, edited by T.W. van der Schaaf, D.A. Lucas and A.R. Hale. Oxford: Butterworth-Heinemann.

Thomas, K.A. 2021. "International rivers as border infrastructures: En/forcing borders in South Asia." *Political Geography* 89:0962-6298.

Thomassen, W. 1974. "Het college van burgermeester en wethouders." In. NL-HaNA Nationaal Archief: ID 3.07.07, inv. nr. 687–702.

Thoroman, B., N. Goode, P. Salmon, and M. Wooley. 2018. "What went right? An analysis of the protective factors in aviation near misses." *Ergonomics* 62 (2). https://doi.org/10.1080/00140139.2018.1472804.

TotaalTrans. 2015. "Minister ontkent onveiligheid vaarwegen door onderbezetting." Accessed 19.4.2015. http://www.totaaltrans.nl/minister-ontkent-onveiligheid-vaarwegen-door-onderbezetting-rws/.

Toussaint, B. 2010. "Bert Toussaint, historicus Rijkswaterstaat." In *Geo-Info 5*, edited by Adri den Boer.

Tribune, D. 1917. "Brand op het Duivelseiland." In *De Tribune*. H. Roland Holst W. v. Ravesteijn D.J. Wijnkoop.

Truscheit, K. 2016. "'Kozentration durch Spielen beinträchtigt'." In *Frankfurter Allgemeine*.

Tufekci, Z. 2017. Twitter and Tear Gas: The Power and Fragility of Networked Protest. New Haven: Yale University Press.

Ullrich, T. 2024. "Mediating Intervention: Space, Class and Differentiation at Paris North Station." *Dimensions. Journal of Architectural Knowledge* 4.

Uricchio, W., and R.E. Pearson. 2002. "Coming to Terms With New York City's Moving Pictures Opterators, 1906–1913." *The Moving Image* 2 (2):73-93.

Väliaho, P. "The Light of God: Notes on the Visual Economy of Drones." Nescus, Accessed 4.12.14. https://necsus-ejms.org/light-god-notes-visual-economy-drones/.

van Dam, P.J.E.M. 2017. "An Amphibious Culture: Coping with Floods in the Netherlands." In *Local Places, Global Processes. Histories of Environmental Change in Britian and Beyond.*, edited by P. Coates, D. Moon and P. Wards, 78–93. Oxford: Oxbow Books.

van den Brink, M. 2010. *Rijkswaterstaat on the Horns of a Dilemma.* Delft: Eburon Academic Publishers.

Van Hulst, M. 2013. "Storytelling at the Police Station: The Canteen Culture Revisited." *British Journal of Criminology* 53:624-42.

Vaughan, D. 1996. *The Challenger Launch Decision: Risky Technology, Culture, and Deviance at NASA.* Chicago: University of Chicago Press.

Vaughan, D. 2021. *Dead Reckoning: Air Traffic Control, System Effects, and Risk.* Chicago: University of Chicago Press.

Vaujany, F.-X.d., and E. Vaast. 2016. "Matters of visuality in legitimation practices: Dual iconographies in a meeting room." *Organisation* 23 (5):763-90.

Verschoor, J., and J.v.d. Giessen. 1990. "RAPPORT OVER EEN ONDERZOEK OP DE SCHEEPVAARTVERKEERSPOST DUIVELSEILAND DORDRECHT." Berenschot. Utrecht: Private Archive.

Vogel, M.M., J. Zscheischler, R. Wartenburger, D. Dee, and S.I. Seneviratne. 2019. "Concurrent 2018 Hot Extremes Across Northern Hemisphere Due to Human-Induced Climate Change." *Earth's Future*. https://doi.org/10.1029/2019EF001189.

Wacquant, L. 2004. *Body and Soul: Notebooks of an Apprentice Boxer.* Oxford: Oxford University Press.

Wel, A.M.v.d., I.A. Ochse. 1922. "De Rijn van Lobith tot aan zee." In, 130 min.: Fabriek Polygoon.

Weller, K., A. Bruns, J. Burgess, M. Mahrt, and C. Puschmann. 2016. *Twitter and Society*. New York: Peter Lang.

Werber, N. 2014. *Geopolitik zur Einführung*. Hamburg: Junius Verlag.

Westeren, F.v., and J. Ellerbroek. 2017. "The Effect of Traffic Complexity on the Development of Near Misses on the North Sea." *IEEE Transactions on Systems, Man, and Cybernetics: Systems* 47 (3):432-40.

Whalen, M., and D. Zimmerman. 1990. "Describing Trouble: Practical Epistemology in Citizen Calls to the Police." *Language and Society* 19:465-92.

Whyte, W.F. [1943] 1993. *Street Corner Society: The Social Structure of an Italian Slum-University.* Chicago: University of Chicago Press.

Wietschorke, J. 2010. "Historische Ethnografie: Möglichkeiten und Grenzen eines Konzepts." *Zeitschrift für Volkskunde* 106:197-223.

Wietschorke, J. 2012. "Historische Anthropologie und Europäische Ethnologie: Zur epistemologischen Verklammerung von Geschichte und Gegenwart in einem Forschungsprogramm." *H-Soz-Kult*.

Wikipedia. 2020. "Prevention paradox." Accessed 19.10.2020. https://en.wikipedia.org/wiki/Prevention_paradox.

Will, C. 1875. "Der Mäusethurm bei Bingen." Monatsschrift für rheinisch-westfälische Geschichtsforschung und Alterthumskunde 1:205-16.

Willems, J., T. Busscher, and J. Arts. 2015. "Nieuw beleid voor verouderde vaarwegen: buiten de bestaande en gebaande paden?" In *Colloquium Vervoersplanologisch Speurwerk*. Antwerpen.

Willkomm, J. 2014. "Mediatisierte Sinne und die Eigensinnigkeit der Medien. Für eine medientheoretische Sensibilisierung der sinnlichen Ethnographie." In *Ethnographien der Sinne. Wahrnehmung und Methode in empirisch-kulturwissenschaftlichen Forschungen*, edited by Lydia Arantes and Elisa Rieger, 39–56. Bielefeld: Transcript Verlag.

Willkomm, J. 2022. *Tiere – Medien – Sinne: Eine Ethnographie bioakustischer Feldforschung*. Stuttgart: Metzler.

Wilson, D. 2019. "Predictive Policing Managment: A Brief Hiostry of Patrol Automation." *New Formations* 98:139-55.

Wilson, T.L. 2012. "Coming to Terms with History: Translating and Negotiating the Ethnographic Self." *H-Soz-Kult*.

Wuis, H. 1974. "Huur en indeling kantoor direktie Benedenriviren te Dordrecht." In. NL-HaNA Nationaal Archief: ID 3.07.07, inv.nr. 687–702.

WWA. 2019. "Heatwave in northern Europe, summer 2018." Accessed 14.1.2019. https://www.worldweatherattribution.org/attribution-of-the-2018-heat-in-northern-europe/.

Yates, J. 1989. *Control through Communication: The Rise of System in American Management.* Baltimore: John Hopkins University Press.

Zanten, A.M.v. 1983. "Werkzaamheden Post Dordrecht." Rijkswaterstaat. Dordrecht: Private Archive.

Zhang, W., F. Goerlandt, P. Kujala, and Y. Wang. 2016. "An advanced method for detecting possible near miss ship collisions from AIS data." *Ocean Engineering* 124:141-56.

Zibreg, C. 2019. "Gameloft previews Dungeon Hunter 5 with a new multiplayer system, launching later this year." iDownloadblog.com, Accessed 5-5-2019. https://www.idownloadblog.com/2015/01/21/dungeon-hunter-5/.

Zielinksi, S. 2006. *Deep Time of the Media: Toward an Archaeology of Hearing and Seeing by Technical Means*. Cambridge, MA: MIT Press.

Zillinger, M. 2014. "Media and the scaling of ritual spaces in Morocco." *Social Compass* 61 (1). https://doi.org/10.1177/0037768613513941.

Zola, É. 1898. "J'Accuse…!" In *L'Aurore*. Paris: Georges Celmenceau.

Zwijnenburg, D. 1984. "Werkzaamheden VERKEERSLEIDERS D.G.S.M." Dordrecht: Private Archive.

List of Figures

Introduction

Chapter 1

Figure 9: Cruquius, N..1729, map, Nationaal Archief (144), Den Haag, https://www.nationaalarchief.nl/onderzoeken/kaartencollectie/af935da2-d0b4-102d-bcf8-003048976d84.

Figure 10: Author Unknown, Map, Nationaal Archief (8.44l), Den Haag, https://www.nationaalarchief.nl/onderzoeken/kaartencollectie/af8c8d74-d0b4-102d-bcf8-003048976d84

Figure 11: Rijkswaterstaat. 1927, map, Regionaal Archief Dordrecht (552_160037), Dordrecht, https://beeldbank.regionaalarchiefdordrecht.nl/search/detail/id/074F37AEAD08C03C471EDECE04448BAF/showbrowse.

Figure 12: KLM Fototechnische dienst. 1920, aerial photo, Regionaal Archief Dordrecht (552_406225), Dordrecht, https://beeldbank.regionaalarchiefdordrecht.nl/search/detail/id/1EAAB033F7DF362488421B66E0BB16F1/showbrowse.

Figure 13: Morks. 1966, map, Regionaal Archief Dordrecht (552_160134), Dordrecht, https://beeldbank.regionaalarchiefdordrecht.nl/search/detail/id/7345C4C4FD4D0203772F29C64923E8A1/showbrowse.

Figure 14: Beckman. 1984, drawing, Regionaal Archief Dordrecht (552_230562), Dordrecht, https://beeldbank.regionaalarchiefdordrecht.nl/search/detail/id/A694D8EBD5F36F65AD690B1F43ECA541/showbrowse.

Figure 15: Nispen, M. van. 1675–1685, drawing, Regionaal Archief Dordrecht (552_231953), Dordrecht, https://beeldbank.regionaalarchiefdordrecht.nl/search/detail/id/E4DDFCB1929017626D132152395C7847/showbrowse.

Figure 16: Topografische Dienst. 1920, map, Regionaal Archief Dordrecht (552_130247), Dordrecht, https://beeldbank.regionaalarchiefdordrecht.nl/search/detail/id/B0E40802A0E2534A2193789E5889F9E7/showbrowse.

Figure 17: KLM Fototechnische dienst. 1922, aerial photo, Regionaal Archief Dordrecht (555_14653), Dordrecht, https://beeldbank.regionaalarchiefdordrecht.nl/search/detail/id/2C44C1E8CF3991C305CB9ABFF89B831A/showbrowse.

Figure 18: Twitter, Inc. September 24, 2017, tweet by @VLW_Rolph, www.twitter.com.

Figure 19: Twitter, Inc. November 24, 2017, Tweet by @asherboersma, www.twitter.com.

Figure 20: Rijkswaterstaat. 1975, drawing, Nationaal Archief (853–856), Den Haag.

Figure 21: Rijkswaterstaat. 1979, plan, Nationaal Archief (853–856), Den Haag:

Figure 22: Grontmij N.V. 1977, drawing, Nationaal Archief (853–856), Den Haag.

Figure 23: Grontmij N.V. 1977, drawing, Nationaal Archief (853–856), Den Haag.

Chapter 2

Figure 1: Zwijnenburg, D. 1986, photo.

Figure 2: Rijkswaterstaat. 1992, Rijkswaterstaat Beeldbank (5287–020), Utrecht, https://beeldbank.rws.nl/MediaObject/Details/De_regionale_verkeerscentrale_voor_de_scheepvaart_te_Dordrecht_78403?resultType=Search&resultList=154746,108263,108262,108261,108260,108259,108258,108257,106614,101172,101171,101170,94352,90127,78403,71021,71020,71019,71018,71017.

Figure 3: Boersma, A. February 20, 2018, photo.

Figure 4: Rijkswaterstaat. Hernieuwde aankondiging van de aanbesteding, 1979, letter.

Figure 5: Zwijnenburg, Dirk. Early 1980s, photo.

Figure 6: Grontmij N.V. Bedrijfsvestiging Duivelseiland: 2nd and 3rd Floor, 1977, drawing.

Figure 7: MGR. Regionale Verkeers Centrale Dordrecht gemoderniseerd, 1996, in Scheepvaartskrant, photo, 31.

Figure 8: Zwijnenburg, Dirk. *Jaroslaw/Lehkering 17*, 1983, map, Verkeerspost Dordrecht.

Figure 9: Van der Meer, Karelse. Verkeerspost Nijmegen: Voorlopig ontwerp, 1999, artist's impression.

Figure 10: Boersma, A. April 11, 2016, photo.

Figure 11: Boersma, A. September 19, 2016, photo.

Figure 12: Boersma, A. September 19, 2016, photo.

Figure 13: Boersma, A. September 19, 2016, photo.

Chapter 3

Figure 1: Boersma, A. February 20, 2018, photo.

Figure 2: Anema, T. [et al.]. 1998, in: Nat & Droog: Nederland met andere ogen bekeken, photo, Architectura & Natura Press, 103.

Figure 3: Schuurbiers, R.. 2015, photo, Simacan Traffic Centre, Helmond, https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwihy_vU7r7sAhWpAGMBHSznDXEQFjAAegQIAhAC&url=https%3A%2F%2F2016.semantics.cc%2Fsites%2F2016.semantics.cc%2Ffiles%2Ffiles%2FKing%2520visits%2520traffic%2520control%2520center%2520Helmond_Simacan-news.pdf&usg=AOvVaw05_0atFRGzj2_hCcQbocyE.

Figure 4: Wirsing, G. *Het Grote Proefstuk*, 1944, drawing, in: *Signal* 8: 14–15.

Figure 5: Broeren-Huitenga, J.J. February 17, 2016, photo.

Figure 6: Gazprom. We Light up the Football, August 5, 2013, still, https://www.youtube.com/watch?v=HjXfs9L-Lyk.

Figure 7: Castellano G. 1920s-1950s, photo, Hagley Museum Collection, Wilmington DE, United States of America, https://www.hagley.org/librarynews/dupont-companys-chart-room.

Figure 8: Marks, D. *Thoughts on the SAP Digital Boardroom*, July 6, 2016, artist's impression, SAP, Walldorf, https://blogs.sap.com/2016/07/06/thoughts-on-the-sap-digital-board-room/. & Brecht, C.. *TSG 1899 Hoffenheim Promotes Young Talent Through Cutting-Edge Technology*. April 28, 2020, SAP, Walldorf, https://news.sap.com/2020/04/tsg-1899-hoffenheim-young-talent-technology/.

Figure 9: Lertes, P. *Fernbiltechnik u. Elektrisches Fersehen*, 1926, H. Bechold Verlagsbuchhandlung, Frankfurt am Main.

Figure 10: Lucas, G. THX 1138, 1971, still, Warner Bros Entertainment Inc., Burbank, CA, United States of America.

Figure 11: Badham, J. WARGAMES, 1983, poster, United Artists Corporation, Beverly Hills, CA, United States of America.

Figure 12: Nederlandse Omroep Stichting. Still, November 22, 2015, https://www.npostart.nl/nos-journaal/22-11-2015/POW_00943145?utm_medium=refferal&utm_source=tvblik.

Figure 13: Emans, H., C. Kuyl, E. Muller, U. Rosenthal. Crisis: Kernramp ,1997, Nederlandse Programma Stichting.

Figure 14: Boersma, A. February 3, 2017, photo.

Figure 15: Boersma, A. February 3, 2017, photo.

Figure 16: Boersma, A. April 19, 2017, photo.

Figure 17: Wasser- und Schiffahrtverwaltung des Bundes. *Revierzentrale Duisburg: Sicherheit auf dem Rhein und Westdeutschen Kanälen*, 2011, leaflet, Bundesambt für Seeschiffahrt und Hydrographie, Rostock.

Figure 18: Cormont, H. 1988, photo, Beeldbank Rijkswaterstaat (2906-084), https://beeldbank.rws.nl/MediaObject/Details/Hoogwater_op_de_rivier_de_Waal_44738.

Figure 19: Mies, J. 2014, photo, Beeldbank Rijkswaterstaat (467755), https://beeldbank.rws.nl/MediaObject/Details/De_verkeerspost_Schellingwoude__waar_de_scheepvaartverkeersbeleiding_op_het_Binnen_IJ_geregeld_word_vanuit_de_verkeersposten_assisteren_verkeersleiders_van_Rijkswaterstaa_467755.

Figure 20: Jacobs, R.. 1988, photo, Beeldbank Rijkswaterstaat (1373–024), https://beeldbank.rws.nl/MediaObject/Details/Verkeerspost_voor_de_scheepvaart_te_Dordrecht_20715?resultType=Search&resultList=20714,20715,20713,20704,20707,20706,20710,20705,20709,20711,20689,20687,20688,20679,20681,20678,20684,20683,20686,20682?.

Figure 21: Boelens, J. 1996, still, Beeldbank Rijkswaterstaat (299348), https://beeldbank.rws.nl/MediaObject/Details/Een_videofilm_over_het_Verkeersbegeleidend_systeem_Drechtsteden__over_het_in_veilige_banen_leiden_van_de_vele_scheepvaartbewegingen_rondom_Dordrecht

Figure 22: Poortvliet, T. Photo, https://beeldbank.rws.nl.

Figure 23: Poortvliet, T. Photo, totaaltrans.nl/minister-ontkend

Figure 24: Poortvliet, R. https://www.bics.nl/?q=de/home

Chapter 4

Figure 16: Twitter, Inc. January 1, 2018, tweet by @VLW_Rolph, https://www.twitter.com.
Figure 17: Twitter, Inc. July 1, 2016, tweet by @VLW_Rolph, https://www.twitter.com.
Figure 18: Boersma, A. November 28, 2016, photo.
Figure 19: Twitter, Inc. August 3, 2017, tweet by @VLW_Rolph, https://www.twitter.com.
Figure 20: Twitter, Inc. September 29, 2016, tweet by @VLW_Rolph, https://www.twitter.com.
Figure 21: Twitter, Inc. August 16, 2016, tweet by @VLW_Rolph, https://www.twitter.com.
Figure 22: Twitter, Inc. July 31, 2019, tweet by @VLW_Mark, https://www.twitter.com.
Figure 23: Twitter, Inc. April 23, 2019, tweet by @VLW_Mark, https://www.twitter.com.
Figure 24: Twitter, Inc. September 13, 2016, tweet by @JAvDrongelen, https://www.twitter.com.
Figure 25: Twitter, Inc. May 12, 2017, tweet by @VLW_Joost, https://www.twitter.com.
Figure 26: Twitter, Inc. September 28, 2016, tweet by @corhospes, https://www.twitter.com.
Figure 27: Twitter, Inc. September 28, 2016, tweet by @VLW_Jos, https://www.twitter.com.
Figure 28: Twitter, Inc. October 19, 2019, tweet by @VLW_Dave, https://www.twitter.com.
Figure 29: Twitter, Inc. November 17, 2016, tweet by @VLW_Rolph, https://www.twitter.com.
Figure 30: Haynes, B. NORAD Tracks Santa – 10th Tracking Season Commemorative Album, 1964, record sleeve, Century Records.
Figure 31: Twitter, Inc. November 19, 2016, tweet by @VLW_Mark, https://www.twitter.com.
Figure 32: Twitter, Inc. November 18, 2017, tweet by @VLW_Rolph, https://www.twitter.com.
Figure 33: Twitter, Inc. June 1, 2018, tweet by @VLW_Joost, https://www.twitter.com.
Figure 34: Twitter, Inc. March 26, 2019, tweet by @VLW_Jos, https://www.twitter.com.
Figure 35: Twitter, Inc. November 30, 2016, tweet by @VLW_Rolph, https://www.twitter.com.
Figure 36: Twitter, Inc. September, 21, 2016, tweet by @VLW_Mark, https://www.twitter.com.

Chapter 5

Figure 12: Boersma, A. August 15, 2018, photo.
Figure 13: Boersma, A. August 15, 2018, photo.
Figure 14: Boersma, A. August 17, 2018, photo.
Figure 15: Boersma, A. August 17, 2018, photo.
Figure 16: MarineTraffic. Screenshot made by author, November 27, 2017, www.marinetraffic.com.
Figure 17: Boersma, A. March 29, 2017, photo.
Figure 18: Boersma, A. November 18, 2016, photo.
Figure 19: Boersma, A. December 6, 2016, photo.
Figure 20: Boersma, A. November 4, 2016, photo.
Figure 21: Boersma, A. November 29, 2016, photo.

Conclusion

Figure 1: Boersma, A. October 13, 2018, photo.

Editorial

The open access book series "Media in Action", conceived by the DFG Collaborative Research Centre "Media of Cooperation", examines the history and present of networked, data-intensive media and their social implications at the interdisciplinary interface of social and media studies. In the tradition of science and technology studies and actor-network theory, German and English monographs, edited volumes and dissertations of the series focus on practices, (co-)operations and procedures in the use, production and analysis of old and new media. A central challenge the series faces is the development of appropriate ethnographic, digital, sensor-based and design-oriented methods for a new conception of the description of distributed agency between people, computers, bodies and environments.
Funded by the German Research Foundation (DFG) – Project number 262513311 – SFB 1187.

Asher Boersma develops North Sea shipping policy for the Dutch Ministry of Infrastructure and Water Management. Initially a media scholar at Utrecht University, he branched out into science and technology studies (STS) and workplace studies, completing a PhD at the Locating Media Graduate School at Universität Siegen. Most recently at Universität Konstanz, Johannes Gutenberg-Universität Mainz, and now in The Hague, he works at the intersection of social, economic and geographical dimensions of technologically mediated mobility and infrastructure.