



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

ARCHIVIO ISTITUZIONALE
DELLA RICERCA

Alma Mater Studiorum Università di Bologna Archivio istituzionale della ricerca

The Heartbeat Of Fieldwork. On Doing Ethnography In Traffic Control Rooms

This is the final peer-reviewed author's accepted manuscript (postprint) of the following publication:

Published Version:

Coletta C (2021). The Heartbeat Of Fieldwork. On Doing Ethnography In Traffic Control Rooms. GBR : Oxford University Press [10.1093/oso/9780198860679.003.0005].

Availability:

This version is available at: <https://hdl.handle.net/11585/803741> since: 2021-08-31

Published:

DOI: <http://doi.org/10.1093/oso/9780198860679.003.0005>

Terms of use:

Some rights reserved. The terms and conditions for the reuse of this version of the manuscript are specified in the publishing policy. For all terms of use and more information see the publisher's website.

This item was downloaded from IRIS Università di Bologna (<https://cris.unibo.it/>).
When citing, please refer to the published version.

(Article begins on next page)

This is the final peer-reviewed accepted manuscript of the chapter

Coletta, Claudio, 'The Heartbeat of Fieldwork: On Doing Ethnography in Traffic Control Rooms', in Gillian Symon, Katrina Pritchard, and Christine Hine (eds), *Research Methods for Digital Work and Organization: Investigating Distributed, Multi-Modal, and Mobile Work* (Oxford, 2021; online edn, Oxford Academic, 18 Nov. 2021).

The final published version is available online at:

<https://doi.org/10.1093/oso/9780198860679.003.0005>

Rights / License:

The terms and conditions for the reuse of this version of the manuscript are specified in the publishing policy. For all terms of use and more information see the publisher's website.

This item was downloaded from IRIS Università di Bologna (<https://cris.unibo.it/>)

When citing, please refer to the published version.

The Heartbeat of Fieldwork

On Doing Ethnography in Traffic Control Rooms

Claudio Coletta

Introduction

The development of smart urbanism, urban informatics, and the worldwide adoption of software and sensing networks to manage urban services offer an important source of knowledge for the study of digitally mediated work and organizational processes. At the same time, the re-distribution of agency through the networked and real-time nature of urban management challenges our research practice. How do we maintain coherent approaches and methods within an increasingly complex setting? This chapter directs attention towards the temporal aspects of such a dilemma and specifically focuses on time and temporality in ethnographic practice in relation to the temporality of the fieldsite.

In particular, I will discuss how heterogeneous temporalities scale up and down; how they resonate into algorithms, management, and working practices; and how ethnographers can engage with such dynamics. In other words, I am going to explore how an apparently tiny phenomenon—such as the time-frequency of a traffic related sensing device—connects to an apparently large phenomenon, such as networked mobility management in cities, and to discuss the role of ethnography in accounting for that connection. The chapter describes a case of a Traffic Control Room (TCR) as an emblematic site where ethnographic practice and socio-technical processes meet temporal complexity. I offer an account of the mutual engagement between research and fieldwork, aiming to escape the native–observer dichotomy and bring to the fore the rhythms as collectively produced by interferences, interruptions, and repetitions.

I am looking at TCRs as specific instances of *oligoptika* (Latour and Hermant 1998), that is, software enabled centres of calculation through which the urban space is scaled down to obtain screen size representations and make the city describable and manipulated. In this sense, TCRs represents an *oligoptikon* which allows tracing of the invisible texture of mediators that compose cities. Yet, TCRs are nodes connected to large networked infrastructures, where calculation is *dispersed* (Czarniawska 2004) and data sourced from different networked devices. Therefore, TCRs represent a crucial case to study what I would call ‘networked management’, that is,

the distributed management happening through dispersed calculation and software, adopted to manage digitally networked infrastructures like those related to mobility.

(Urban) control rooms have largely been observed to allow us to understand the interplay of software, work, and management, exploring how this affects life in cities and shapes urban space. However, the same attention has not been paid to the temporality of algorithms and working practices, especially in relation to the temporalities enacted through research practice itself. I argue that acknowledging the temporalization of research methods is most needed, especially when temporal aspects are materially embedded into and distributed across working practices and software. My approach draws on the ethnography of infrastructure (Bowker and Star 1999; Star 2002) and the temporal dimension of this approach. As Star and Ruhleder (1996, 111–12) point out, ‘what is an infrastructure?’ is a misleading question because infrastructures are not static, transparent, and ready-to-hand entities. We should better ask—they continue—‘When is an infrastructure?’, because infrastructures come into being in relation to heterogeneous and materially organized practices. As the becoming of an infrastructure happens in time, it also performs time: rather than accelerating the circulation of things, infrastructures produce intervals and interruptions and represent an *apparatus of delay*, ‘out of which the present extracts wealth from the future’ (Mitchell 2020).

The concept of ‘heartbeat’ will help me to describe the temporal entanglements in networked management of networked infrastructure. The word *heartbeat* recurred at various times during fieldwork, when interviewing city managers and practitioners. My research investigating the construction of Dublin as a smart city was part of a five-year research project, ‘The Programmable City’, focused on the translation of space into software and the transduction of software into space. The participants interviewed stressed the co-existence of many different timelines within Dublin: those produced in real-time urban management, whose *beats* are calculated in fractions of a second; and those that are produced by the deeper time of the city and its historical cycles, whose pulse rate is measured in decades and more. The *heartbeat of the city*—as one of the participants called it—coalesces as a complex timescape including many mutable urban rhythms acting at different and interfering frequencies. Algorithmic calculations and real-time management interact with the lived experience of people coping with parking, lighting, cars, public transportation, and the possibility to be informed in real-time and ‘at the touch of a button’ on traffic conditions. In turn, the data produced and the devices used in these measurements and calculations affect long-term decisions on mobility, environment, and other areas, and ultimately influence strategic planning and positioning with respect to other cities. All these aspects point to the complexity and heterogeneity of urban timescapes and to the issue of integrating different temporalities in management processes, especially in an age of desynchronization with ‘a greatly increased variation of different people’s times’ (Urry 1994, 141). Given the interconnected and multifarious kind of rhythms and measures, management needs to combine different *tempos* in order to be effective. On the one hand, organizing the overlapping, concatenated, multiple rhythms of everyday life allows the generation of predictable models which are used to manage

systems that mediate urban life; on the other hand, setting up the frequency and choosing the right measures requires continuous adjustments and balances, which depend on historical and contemporary city life. Thus, setting a rhythm requires making an important distinction between what is relevant for management and what is not, what is predictable and counts and what is not. Understanding how things become relevant through the lens of time has an important implication for research methods and their ability to tune in with the fieldwork, to study its tempos and their connections, and ultimately re-temporalize the research accounts.

Addressing the 'when' question, the chapter examines the activities taking place in a specific TCR across three connected issues. The first section describes the peculiarity of urban automated management in the digital age, and the shift from a clock-time (Adam 1990) to a real-time based society where big amounts of data circulate through digital and networked infrastructure, and thus inform automated decision making. More precisely, real-time processes can be considered as *realtimeness* (Weltevrede et al. 2014; Kitchin 2018), namely a contingent and relational product of working practices, software calculations, and other socio-technical arrangements, each of them with a specific real-time culture. The second section explores rhythms and rhythm-making, how the realtimeness is maintained and performed and how different temporalities coexist in it. Both sections aim to offer an analytical toolkit through a descriptive interplay of theoretical issues and empirical findings, to understand how the heartbeats of fieldwork are produced. The third section addresses the ethnographic methods and techniques, the way they enter into the particular real-time culture of a TCR, how they adapt to the complex rhythms of the fieldwork, and how the heartbeat of fieldwork is made 'audible' through research. I will introduce the concept of 'halfway ethnography' to describe the capacity of ethnographic practice to look in between beats and thus account for the interferences and changes of pace in complex settings. I will conclude the chapter proposing the concept of heartbeat as a way to redefine the analytical categories related to time and to engage with an increasingly temporally entangled fieldwork.

Synchronization, Rhythm-making, and Urban Management

In theoretical terms, time has been a crucial issue for social theory, especially in terms of its relations with social action (Nowotny 1992), the different ways through which it is articulated by social practices, and how it contributes to the human experience. With this purpose, Ballard (2007) introduces the concept of *chronemics* to describe the mechanism that allows the production of cyclical time (rhythm), synchronization of cycles (mesh), temporal patterns (tempos), time variations (paces), and the interactions among them. While Ballard's focus is on human agency and on the empirical aspects of the workplace, my attempt will be to adapt the temporal toolkit to emphasize the role of technologies and the methodological implications of a temporally, socially, and materially heterogeneous fieldwork. Taking the cue

from Felt (2015), my aim is to account for a 'temporal choreography' that specifically addresses infrastructures, work, management, and ethnographic practices.

In methodological terms, while the issue of 'where the ethnography takes place' and 'where the action is' has been largely addressed, the issue of *when* the ethnography takes place and how it is synchronized with the fieldwork seems to have been less explored. As Dalsgaard and Nielsen (2013, 8) point out, what is required is to acknowledge the time dimension of fieldwork 'both in relation to concrete ethnographic work and as an anthropological representation ... identifying the precise juncture at which new insights are constructed from the relationship between research questions and ethnographic data'. Synchronization affects ethnographic practice as well as the temporality of settings where ethnography takes place, the ethnographic account depending on the way the heartbeat of the fieldwork is set.

When approaching the Traffic Control Room, I did not start my fieldwork with the idea of rhythms and temporalities. The TCR was in fact one of the cases featuring Dublin smart city development, following the Smart Dublin initiative:¹ my job, together with my colleagues, was to map all the smart city related projects undertaken in the city, including traffic management. The research enabled me to undertake extensive interviews with researchers, entrepreneurs, associations, and city managers, who talked about different cases of smart city related services. The rhythm idea came to me on a rainy Irish afternoon, when I was interviewing a researcher in engineering, working on sensing devices for air pollution monitoring. In the interview, quite a few exciting 'boring things' came out, as Star (2002) called things hidden in plain sight that, once noticed, allow us to unravel the entanglements around them. What initially emerged as a side story of my research activity led me to look back to previous interviews and focus the analysis on temporal aspects; those that bind together digital technology and management. This episode made me reflect on a primary issue related to ethnographic practice: how do you decide that the things you are investigating through ethnography are concerns? And to whom? Doing qualitative research on (and in) cities seems especially indicative of the serendipitous character in the exploration of urban phenomena (Sonda et al. 2010). As Van Maanen (2011, 220) has pointed out, 'learning in and out of the field is uneven, usually unforeseen and rests more on a logic of discovery and happenstance than a logic of verification and plan'. Taken in a temporal perspective, the 'in and out' of ethnographic practice allows a serendipitous movement backwards and forward across the data collection routine, reflexivity, and writing. At a certain point, moving in and out of time, back and forth through a number of notes, conversations, materials, a change of pace happens: the ethnographic routine requires a new attunement, a new rhythm to cope with the one of the fieldwork, a new *beat*; that is when ethnography produces a drift from boredom to surprise, which forces you to differently re-articulate the entanglement in a possible, meaningful way. The conversation below, which took place in February 2016 at the middle stage of my fieldwork, was precisely the initial spark for my interest in temporality:

INTERVIEWEE: It takes time to understand whether sensors work or not. You need to choose the interval in which you retrieve the data. Because if you retrieve them every second, you have plenty of information, but there also can be much noise. If you retrieve them every hour it is more normal but you can lose information, so you need to find a compromise, the right balance.

INTERVIEWER: Also in relation with the times of the city: morning, peak hours, evening ...

INTERVIEWEE: Exactly. Then the higher the resolution, the higher the consumption of battery; the more you keep data in the flashcard, the more you have to transmit them. There is a whole series of compromises you need to deal with. (Engineer, University)

The interview surprised me because it accounts for epistemological and ontological issues in a very pragmatic manner: epistemological, because it is the time intervals that decide what is signal and what is noise, what is relevant and what is not; ontological, because time-frequency has a material dimension and depends on the durability of the battery and the memory of the flashcard. Moreover, both epistemological and ontological aspects appear as contingencies of a practical 'compromise': how to adjust the time in order to listen to the 'heartbeat of the city'?

Once granted access, my research colleagues and I started to follow the development of the Smart Dublin initiative and we began facilitating workshops. We mapped ongoing initiatives connected with the Smart Dublin strategy, contacted related people, and arranged interviews. Basically, the pattern was quite straightforward: meet the interviewees, get their signed consent, ask questions, listen, record, encrypt, transcribe, repeat. We created a spreadsheet with the cases classified according to respective areas (Smart Mobility, Environment, Living, etc.), type of service provided (e.g. tourism, waste management, etc.), technology adopted (e.g. sensor network, web platform, mobile app), scale (e.g. local authority, city region, national, etc.), organizations involved, and so on. The spreadsheet allowed us to monitor the progress of research, recording contacts, the status of the interview (done/to do), the status of the related information sheet we were supposed to write (done/to do). Similar to a palimpsest, the spreadsheet was reworked and adapted several times as the team added and amended categories and the number of interviews grew. It also acted as a shared rhythm-making tool, setting up the pace and keeping track of the teamwork. The surprise came with repetition and routine: the rhythm of interviews and analysis and the resonance between the two added more questions and categories, which in turn were translated into new rows and columns. After a number of weeks of fieldwork, the Principal Investigator asked for a meeting to tune up our categories of analysis: 'Let's bring one transcribed interview each and code them together'. We started at noon with the first bit of transcript:

Well I suppose it's in common with most large cities we have had a traffic control centre for a number of years. So our first traffic control centre was built around 1987 or even 1986 and it has gone through several different iterations and expansions and so on. The latest version of it was considerably changed in 2013. The traffic management centre itself is a 24 hours, 7 day a week operation, it is staffed by our own control room operators. At peak times it has people from AA Roadwatch which is the motoring organisation here. We have facilities for the police and the public transport service to be here as well, so at the moment during the run up to the Christmas busy time they are in there every day. So we have somebody from the police and somebody from the public transport operators. We also have our own dedicated radio station which broadcasts six hours a day, 7:00 to 10:00 and 4:00 to 7:00. And the idea of that is it provides very detailed traffic information to people in very much a real time fashion using all the cameras and the technology that we have in the traffic control centre. (Senior executive manager, Local Authority)

Initiation year, peak times, continuous 24/7 time, evolutionary times, cyclic times, real-time, Christmas time, broadcast times—and it was just the first paragraph. A couple of transcripts, 40 pages and three hours later, we were pretty convinced that time and temporality were important categories to understand smart city development in Dublin. The temporality of texts analysed interacted with the temporality of our research practice: we tuned up our own categories and 'at the same time' shaped the rhythm for future analyses and fieldwork. During the following interviews, time and temporality were resonating at the back of my head until coming to the forefront one rainy afternoon in February 2016, when I met the engineer who was working on sensing devices for air pollution monitoring: time, indeed. No, wait, more than time: frequency, rhythm, 'algorhythms'!²

As I addressed the literature, I acknowledged that the idea was not new, but embedded in a multifarious and rich debate, starting with the notion of algorithm (Miyazaki 2012). At the same time, the 'scientific debate' did not exactly pre-exist the idea, rather it has been actualized in a specific, situated version. Being immersed in the literature pushed me to negotiate a position and angle the phenomena so to emplot the literature and the fieldwork in a story, a polyphonic one, where STS, software studies, and organization theory resonate and interfere with the concepts of rhythms and refrains.

From Rhythmanalysis and Temporal Work to Rhythm-Making and Productive Repetitions

According to Lefebvre (2004), rhythms are interactions between a place, a time, and an expenditure of energy. They are brought into existence as interferences of linear and cyclical processes through measure, calculation, and repetition to make things

familiar, maintained, manageable. Yet 'there is no identical absolute repetition, indefinitely. Whence the relation between repetition and difference ... always something new and unforeseen that introduces itself into the repetitive: difference' (Lefebvre 2004, 6). As Elden (2004, 195) explained, Lefebvre's interest concerned the 'interdynamics' of rhythm which materializes in everyday life, namely 'how various rhythms relate to one another (in, say, polyrhythmic, isorhythmic, eurhythmic, or arrhythmic forms)'. As noted by Borch and colleagues (2015, 1082–84) in their account of high-frequency trading, while rhythmanalysis provides a rich repertoire to empirically study bodily practices, it needs to be re-actualized to grasp how rhythms are translated into software algorithms. Such approaches include a recent thread of research which adapted rhythmanalysis to study the technological and algorithmic aspects of environmental processes (Palmer and Jones, 2014; Walker, 2014) and traffic management (Coletta and Kitchin 2017).

The actualized version of rhythmanalysis suggests (1) looking at algorithms as part of a bigger assemblage (Dourish 2016), which is also time related; (2) looking at how rhythms embedded in bodily practices interfere with material and digital rhythms at a different scale; (3) focusing on the way the rhythms and temporality of software and networked infrastructure encounter those of networked management and working practices.

The temporal aspects of management, organizational, and institutional processes have been investigated by organization theory since the late 1980s (Dubinskas et al. 1988; Gherardi and Strati 1988). The focus was originally on the multiplicity of temporal ordering (evolutionary, mythical, historical, metahistorical, forward/backwards-looking) and on the embeddedness of organizational times into different media (speech, writing, narrative accounts, etc.). The idea of time and organizational life as both shaping and shaped by each other leads towards a qualitative understanding of temporal phenomena. Rather than the content of the fieldwork, the contributions in the field show a dialogue between the temporal aspects of the ethnographic method and the temporal work of organizational life. Scholars have emphasized the greater relevance of kairotic over chronological time (Whipp et al. 2002; Czarniawska 2004; Rämö 2004), where the qualitative and entangled features of time that define events are more interesting than its measurable and linear aspects. Roe (2009) proposed a pragmatist approach to measured time and experienced time in organizational research, which would help to overcome the opposition between positivist and interpretive perspectives. Studies of the temporal dimension of management explored time in the social practices of organizational and institutional actors. Ancona and Chong (1996) introduced the notion of *entrainment* as 'the adjustment of the pace or cycle of one activity to match or synchronize with that of another' (1996, 251). Orlikowski and Yates (2002) proposed the concept of temporal structuring to describe the multiple temporalities enacted by people in everyday practices, who coordinate distributed activities bridging linear and cyclic, objective and subjective time, Kairos and Chronos. More recently, Granqvist and Gustafsson (2016) introduced the concept of temporal institutional work to describe

how 'actors formulate new temporally constructed understandings' (2016, 1010). Reinecke and Ansari (2015) showed how organizations at the intersection of temporally incongruent worlds engage in 'temporal brokerage' to negotiate conflicts between the timelines of different corporate actors engaged in market and development: these actors leverage on *ambitemporality*, namely they mediate temporal conflicts by switching from and to different temporal constructs, such as clock-time and process time. These contributions provide rich empirical accounts of temporal work for the synchronization and coordination of activities. Here rhythms and cycles result from the interaction of (multiple) temporal structures on the one hand, and structuring practices that adjust and maintain them on the other.

Following the kairoitic sensitivity in qualitative research, I use concepts to describe temporal work (entrainment, ambitemporality, temporal brokerage, and so on) to reflect symmetrically on the temporal work of the ethnographer in relation to the temporal work of the fieldsite. The interplay creates an expanded time infrastructure where ethnographic practice co-exists and co-evolves with the temporality of participants. Such a perspective presents a number of productive features to keep in mind in order to engage with fieldwork.

First of all, it redistributes the agency of ethnographer in time. As we already know that the position of the ethnographer is spatially situated and multi-sited (Marcus 1998; Hine 2000), decentralized and proximal, we are now able to add temporal features to that condition. Situated in time, ethnographic practice participates in a series of rhythms and tempos which compose the heartbeat of the fieldwork. We could even consider that there could be rhythms without external time-givers or *Zeitgeber* (Ancona and Chong 1996; Bluedorn 2002) just as there is 'organizing without knowledge' (Luhmann 1998, 98 cited in Czarniawska 2009). What we have is rather a heterogeneous 'Zeitvermittlung', that is, a specific timescape internally infrastructured and mediated by human, technological, and organizational factors, as well as—ethnographically speaking—*methodological* tempos. Time-giving is thus a collective endeavour involving humans and 'more than human' actors (i.e. a software program, a specific organization of work, etc.), to which we add the timeline of ethnographic activity. During fieldwork, the ethnographers broker time with participants, for example to get their attention or to follow them in relevant activities, in order to entrain, adjust, and mesh each other's timeline. The entrainment also yields to ambitemporality, for example when 'stepping out' from the fieldwork activities to write personal notes and pinpoint analytical or theoretical insights which could be promising to contribute to the project team, to the scientific debate, to the career. Or simply to take a break and temporarily leave the studied activities, tuning up with their rhythm once back. Once considering the action of algorithm and digital tools as participants in the fieldwork, a temporally situated ethnography allows us to understand (1) how the experience and measure of time actually interact with (and are affected by) the temporalities measured by such devices; (2) how time is materialized, configured, and calibrated according to specific knowledge and practices; (3) how tiny technological devices generate new fieldwork relations and how they relate

to a larger assemblage. The spreadsheet mentioned above represents one of the tools that guide the temporal work of ethnographers and allows time brokering among other researchers and participants, but also—as we are going to see below—the technical devices that compose the fieldwork have an effect on the collective temporal experience, creating displaced forms of ambitemporality.

Taking rhythms as constitutive of temporalities of networked management in cities is to shift the focus on translation processes from the linear and chronological ones to the kairotic ‘productive repetition’, synchronization, and interferences of beats in different settings. In fact, as Deleuze and Guattari (1987) point out, repetition does not entail mere reproduction of timing norms and institutionalized temporal routines: repetition is *productive*, that is, it creates a difference, thus generating territorial *refrains* with peculiar regimes of action. Refrains are rhythmic, repeated vibrations, such as the song of the bird which marks its territory or the humming of people in unknown places which establish a feeling of familiarity. In terms of the present analysis, we can consider the refrains as produced by a work of rhythm-making, which is in turn composed by different beats, pulses whose vibrations and interferences produce a familiar space-time arrangement: ‘[t]ime is not an a priori form; rather, the refrain is the a priori form of time, which in each case fabricates different times’ (Deleuze and Guattari 1987, 349). The fieldsite, in this case the TCR, can thus be studied as a specific arrangement produced by rhythm-making, whose beats create refrains. The refrains maintain and combine multiple time patterns, and also allow the passage from one pace to another. This way, beats and rhythms can be used to describe the co-existence, maintenance, and the overlapping of different activities in the same place, and explore how the superposition of polyphonic flows of action—including ethnographic ones—are turned into a refrain, and vice versa how these refrains have their beats reshuffled to produce a new pace.

Halfway Ethnographies in a Traffic Control Room

The Dublin City Council Traffic and Incident Management Centre (TIMC) is a TCR where car traffic is managed remotely by means of operators, software, CCTV, and other tools. TIMC is a liminal place of informal and formal conversations, on-air transmissions and phone calls, automation and human management, a place which hosts dispersed temporalities shaped by multiple rhythms. That is why to grasp its temporal complexity, the ethnography must be liminal itself, both entrained and ambitemporal, acting in between to mesh with the rhythm-making of the field. I would call this kind of ethnographic condition *halfway ethnography*. The term halfway ethnography echoes the work of Karen Barad (2007) on quantum physics and agential realism. It rejects, as Barad does, ‘[the] attempt to find some “middle ground” between social constructivism and scientific realism’ (2007, i vi, 408) and refers in this case to methodological aspects, looking at the concrescence of space, time, and matter (*spacetime mattering*) in doing research. In this sense, halfway

ethnography represents an invitation for researchers to emphasize the temporal aspects of spacetime mattering and focus on beats as well as pauses which participate in the rhythm-making of the fieldwork.

At the centre of Dublin TIMC is the adaptive traffic management system, SCATS (Sydney Coordinated Adaptive Traffic System). SCATS is a software infrastructure that manages in real-time the traffic lights at junctions based on inductive loops installed on the street which count and detect vehicle presence in each lane and the time intervals between them, as well as demand for pedestrian crossings. The system interacts with operators in the TCR who can adapt and adjust SCATS timing based on CCTV monitoring—whose data are not stored—and feedback from drivers. Every 20 seconds, a GPS feed coming from the 1000 or so buses circulating in Dublin is integrated with the data coming from the inductive loops. As you enter the control room you can likely hear radio music coming from the speakers on the walls, and realize that a radio station is inside the room: three smaller desks located in the back-left corner host Dublin City FM's live broadcast of traffic news and music between 7–10am and 4–7pm, Monday to Friday. At the end of each song, the presenter goes on air updating drivers on the traffic situation, supported by an assistant and a producer. Meanwhile, operators continue to type on their CCTV controller, switching from camera to camera and monitoring the flow, also providing an additional layer of beats to the music and the voices inside the room. I would call it a rhythmically—as well as technologically (Bruni et al. 2014)—dense environment, where rhythms engage different human and non-human 'players,' and slow down and accelerate according to the events:

It's the end of yet another interview with A., the supervisor of the traffic control room, I am asking the last questions. Suddenly, the tail of his eye captures something on the CCTV screen that I (being in front of it) did not even notice: a Dublin LUAS tram is stuck in the middle of a busy junction blocking traffic on both ways. He addresses the operator on the other side of the room 'D.? Camera number ***' D. types the number on the CCTV controller, evaluating the possibility to override the SCATS in order to ease the flow which is around the congestion. Few seconds later the radio presenter starts to give the situation on traffic, but he is into another rhythm: he knows that there is something going on, but did not take the last event in the list of updates and skips the info. They call the LUAS control centre to have (or give) updates. Everything lasts a very long five minutes, then the tram moves and frees the street.

(Ethnographic note, 11th of November 2016)

The CCTV controller catches the attention of the operator and changes the pace of the interview, a silence interval in a blink of an eye produces a difference through which the setting of the interview is transduced into the setting of traffic management. The beats of traffic management start to pulse differently, from the supervisor

to the operator on the other side of the room, as a sort of duet, then to the SCATS system to change the phases. These abrupt changes of pace are part of the work inside the room and in turn, they interfere with the organizational refrains: the coffee breaks and lunch breaks, the temporal organization of the work of radio operators (two shifts of 3 hours per day excluding weekends), the work of traffic operators, 24/7 divided into shifts of six hours. The latter generates a further element of interference: the extended presence of operators through the whole day makes them able to provide assistance phone calls on water infrastructure faults and interruptions, providing information and redirecting the call in case of emergencies and repurposing the traffic centre management to a sort of call centre for plumbing issues. Finally, regular meetings of senior managers take place every two weeks to see if the configuration of the system continues to be effective or not and a situation room is available for major events, with desks reserved for police and other authorities during special events or emergencies. It was to observe what happens during one of these special events that I visited the TCR one Saturday afternoon in July.

A very quiet Saturday afternoon, despite Beyoncé being announced as having a big concert in the evening. One operator in the silent room, with the radio station not airing during the weekend. It's a very different atmosphere with respect to the weekdays. The telephone rings, a taxi driver is stuck in the traffic and requires remote assistance to ease the flow. He reports that work in progress barriers have been removed in Stephen Green [one of the busiest junctions in Dublin, where in addition there are construction works for the new LUAS line]. This is probably due to some pedestrians that moved the barriers to create a shortcut for crossing the road, J. says. She checks in one of the displays a document with the updated shifts and contacts of workers in the street and make a call. There is no answer, she take a memo in a notebook to call later. She says with a smile that she recognised the taxi driver on the phone: 'He's not new to call, he was talking hands-off with the speakers on because he wants to bully with the passenger that he can have the way cleared from the traffic management centre'

(Ethnographic note, 9th of July 2016)

In the atmosphere of a Saturday afternoon, J's observation teleports me into the taxi so that I am sitting close to the passenger. I can watch myself in the traffic jam monitored in the CCTV camera controlled by J. in the control room, where she indicated to me precisely the taxi among the other cars, while the driver calls. I am halfway and simultaneously 'there', taking notes about the request and attitude of the taxi driver, and 'here', listening to the operator's account and comments. Then the pace changes again and J. switches to another programme of actions calling the workers on the street. Consider the scene just described in comparison with the following vignette

from Boersma (2013) referring to his account of an ‘Unofficial St. Patrick Day’ local event, monitored from a police surveillance room:

Late at night we had dinner in the operations center. The social media footage, the projected images of CCTV, and local television news reports fused into a long, cluttered image that we eventually experienced as cinema-like. It was as if we—present in the operations center—were watching a movie: eating pizza, drinking soda and staring at fragments of camera images from an event far away without a clear plot, but fascinating enough to hold our attention because we were, in one way or another, involved in the action, like the prison guard at the Panopticon. Halfway through the evening, a student, clearly in a state of drunkenness, yelled at the camera of the local television station: ‘And the police gave us a lot of trouble today!’ causing general laughter in the operating room.

(Boersma, 2013: 115–16)

The surveillance room suggests a similar halfway mechanism, although with an emphasis on space, where the watchers are part of what is being watched: the activity of surveillance, in fact, prescribes a sharp distance between the law enforcement and potential infringements which generates sarcastic laughter. A halfway mechanism based on time sheds light on the interference of infrastructurally mediated pathways of action, such as those of the TCR in Dublin, meshing the schedules of road maintenance, drivers, and pop stars’ concerts. In the meantime, the beats (and digital bits) of traffic users’ tempos—car drivers, public transport, pedestrians, etc.—are silently gathered by the software and used to regulate traffic conditions. The encounter of such human and digital tempos could work eurhythmically or require a change of pace in traffic management workflow, and could also produce a switch from boredom to surprise in the ethnographic work. The point of suspension and micro-hesitation from the creation of one rhythm to another is where the halfway ethnography stands: it allows appreciation of the kairoic temporality where the ethnographic (in this case myself), technological (the calculation apparatus), organizational (the TIMC operator), and everyday (the taxi driver) activities converge or co-exist in the respective complexity and infrastructural loudness. In fact, with respect to the seminal accounts of control rooms (Suchman 1987; Heath and Luff 1992), the Dublin TIMC could appear much more silent: most of the communications have been delegated to automated management and the core staff is composed of five people (four operators and the supervisor) who alternate along the day and night shifts, the radio being in operation only six hours during weekdays. There is little running commentary or ‘self-talk’ (Heath and Luff 1992, 80) whether that be public and short conversations or jokes inside the room (face to face, by phone or by social media) while operators work. The informal spaces devoted to breaks—such as the legendary ‘coffee machine’ (which in this case is the kitchen)—are used in a lonely way for quick breaks. At the same time, in another sense, it is much louder: everybody talks (on the phone, on the radio), but

not (directly) to each other. Radio staff act as traffic controllers and vice versa, they inform each other about the respective activities:

What is good about the radio station is that is a live commentary, they get so much information using tweets, or people texting them. You can back a colleague to say what's happening, but the radio station is actually telling you what it's like as well. It's really helping to do your job. (Traffic controller #1)

As soon as he tells me this, the operator moves to the software that manages billboards on the street, and inserts the ad with the radio and the respective frequency:

It's good way. It's free publicity. We want people [drivers] to listen to radio, as much as possible. (Traffic controller #1)

The CCTV on the operator screen is now showing the sign '103.2 DUBLIN CITY FM RADIO'. The situation is again estranging, halfway: I am in the room, listening to the radio and having an interview. The radio starts to give information to drivers, the operator tells me about the importance of the radio and immediately after activates the electronic billboard somewhere in Dublin, showing it to me with the CCTV management software. Where am I? When am I? Where and when are the operators when doing their work? In this view, halfway ethnography is a way to practise rhythm-making by moving in between beats, ready to grasp whether the last heard beat continues a refrain or rather represents a change of pace, or again is part of a bigger refrain that operates at a larger scale of a living entity. Ultimately, the heart-beat of fieldwork corresponds to the account that the ethnography is able to offer about what is studied. The condition of liminality between being inside the control room and inside the taxi is one example, as well as the condition of boredom and reflexivity that at some stage produces the surprise. Indeed, being halfway is not a privilege of the ethnographer, since as illustrated above traffic management is just one of the activities carried out by the staff, and different monitoring technologies, expertise, and settings are transduced into each other. Such forms of rhythm-making in between the beats reflect and interact with the silences and breaks within phenomena that change the pace of the situation, such as in the case of the LUAS or in the case of switching from the task of traffic operator to the one of support on infrastructure failure, from cameras to SCATS monitor, from certain cycles and phases to overriding them for easing the traffic. The organizing routines interfere with technical rhythms, which in turn interfere with the rhythms of fieldwork. Rhythms are more or less automated and more or less human, with different time ranges, either related to everyday management or to special events, either planned or unplanned. They involve theoretical, methodological and empirical aspects as well as GPS transponders, induction loops, visualizations, working practices, radio stations, large digital and material infrastructure, the whole city.

Conclusion: Heartbeats of Cities, Heartbeats of Ethnography

The chapter has illustrated a time-based ethnographic approach to the study of infrastructure in a case of networked urban management in a TCR. The study addressed the challenge posed by Star and Ruhleder to reflect on ‘when is an infrastructure?’ in empirical, methodological, and epistemological terms. While Gieryn (2006) described cities as a ‘truth-spot’ for urban studies, both the *where* and the *what*—the object and venue of the study—I argue that the focus on urban infrastructure could offer for urban studies a ‘becoming-spot’, whose scientific accountability refers to the *when* and the *how* the heartbeat of fieldwork is produced. Whereas literature on (smart) cities and urban management has given an emphasis to space, I propose to adopt a more symmetrical approach called halfway ethnography, emphasizing the time dimension. Just as the delays and intervals produced by infrastructure could offer sites to extract wealth, in Mitchell’s (2020) terms, the same intervals or ‘time-spots’ offer opportunities to create knowledge value, in methodological and epistemological terms. This value depends on the ability of research to participate in rhythm-making and make sense of the rhythms, cycles, refrains, changes of pace, that compose and contribute to the heartbeat of the fieldwork. The TCR is a networked infrastructure made of different entities acting and interacting at a different time scale: its temporal flows participate in shaping the heartbeat of the city itself, which has an institutional, infrastructural, and historical ‘pulse rate’ measured in days, decades, and centuries, not immediately synchronized with the needs of real-time management (not to talk of the deep time of the Earth). The polyrhythmia and complexity of real-time cities, the superposition of human and non-human rhythms, seem to create a collective ‘algorhythmic trance’ without any centre of calculation or pace-setter. Automation by software algorithms produces a sort of obliteration of time and knowledge: work happens ‘live’, with the real-time videos from the 380 cameras all over the city not being stored, SCATS collects the data from counting the cars and automatically generates statistics to adjust timings without human oversight. Rather than temporal ‘feed-back’ from a specific and human pacesetter, we have a rhythmic ‘feed-around’ and time mediation from multiple beats and tempos, whose interferences contribute to phenomena of accidental urbanism (Coletta et al. 2019), that is, a temporally and spatially dispersed set of experimental smart initiatives that develop autonomously around the city. Knowledge dissolves in repetition and time is manufactured, embedded in technical devices showing the materialized aspects of temporality, the acts of configuring and calibrating time for others, and the heartbeat of larger assemblages.

Whereas the problem of temporality in management processes has been addressed by the scientific literature, either through the dualisms of agency/structure or subjective/objective time, this chapter shows that rhythm-making is based on productive repetition which creates transductions from one setting to another, creating the effect of a slow routine and a sudden change of pace. I believe that embracing

a rhythm-making and halfway perspective offers various advantages to the study of organizing temporality and change. First, it allows us to take into account the agency of non-human entities in the construction of temporality. Second, bypassing the dualist approach to agency-structure allows us to focus on the ‘making without structure’ of temporality from a relational perspective. The same goes for the dualism of tense, subjective time (flowing, kairoitic) and tenseless, objective time (discrete, chronologic): they are the (temporary) product of rhythm-making, as well as the evolutionary, episodic, cyclic and emergent characters of organizational change (Dawson 2014) and become a way to cut the interference of different (algo)rhythm-making. Finally, rhythm-making allows ethnographic and research time to be approached as both a concern and a way to frame how things happen, looking at how ethnography participates in and copes with the construction of multiple rhythms and temporalities. It also involves the issue of how long ethnography needs to last. Especially when doing research in organizational and networked settings, ‘[time] is condensed, and it is counted at many places concurrently. It is not only coeval, but also multiple. And it runs fast. The journalists I studied could not understand why I needed so much time to write my report. They believed as well that it would become obsolete in a year’ (Czarniawska 2012, 133).

‘As our world at reach has widened’—Czarniawska continues—‘there is a problem in trying to record and interpret it. Zapping is one solution; a bird’s-eye view another; but they hardly solve the difficulty of contemporary fieldwork: how to study the same object in different places at the same time?’ Halfway ethnography represents one possible way to study the different temporalities in the same place, or even different temporalities in different places, one possible way to deal with dispersed time-space and calculation and connect the time-boundedness of computational cultures, the time-boundedness of management cultures, and the time-boundedness of ethnography.

Acknowledgements

Thanks to Rob Kitchin and the whole Programmable City team in Maynooth University where the ideas in this chapter were initially developed. I am grateful to Christine Hine, Katrina Pritchard, and Gillian Symon for their generous editorial guidance and precious comments, which have helped me to write a more thoughtful contribution.

Funding

This work was supported by the ‘Programmable City’ project, funded by a European Research Council Advanced Investigator award (ERC-2012- AdG-323636-SOFTCITY) and by the ‘INFRATIME’ project, funded by the European Union’s

Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 892522.

Notes

1. The initiative (www.smartdublin.ie) involves the four Dublin Local Authorities: Dublin City Council, Dun Laoghaire-Rathdown City Council, Fingal City Council, South Dublin City Council. It consists of a mix of data-driven, networked infrastructure to foster economic growth, entrepreneurship, and citizen-centric initiatives (Coletta et al. 2019). The source material of the chapter is drawn from a set of 25 interviews and explicit participant observation conducted by three researchers between October 2015 and December 2016. All participants agreed to the use of their interviews after informed consent.
2. The notion of “algorhythm” has been introduced by Miyazaki (2012), as a computational model of “a machine that makes time itself logically controllable and, while operating, produces measurable time effects and rhythms” (p. 5)

References

- Adam, B. 1990. *Time and Social Theory*. Cambridge: Polity Press.
- Ancona, D., and Chong, C.-L. 1996. Entrainment: pace, cycle, and rhythm in organizational behavior. *Research in Organizational Behavior*, 18: pp. 251–84.
- Ballard, D. 2007. Chronemics at work: Using socio-historical accounts to illuminate contemporary workplace temporality. *Research in the Sociology of Work*, 17: pp. 29–54.
- Barad, K. 2007. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Durham: Duke University Press.
- Bluedorn, A. C. 2002. *The human organization of time: Temporal realities and experience*. Stanford: Stanford Business Books.
- Boersma, K. 2013. ‘Liminal surveillance: An ethnographic control room study during a local event. *Surveillance & Society*, 11(1/2): pp. 106–20.
- Borch, C., Hansen, K. B., and Lange, A.-C. 2015. Markets, bodies, and rhythms: A rhythmanalysis of financial markets from open-outcry trading to high-frequency trading. *Environment and Planning D: Society and Space*, 33(6): pp. 1080–97.
- Bowker, G. C., and Star, S.L. 1999. *Sorting Things Out: Classification and Its Consequences*. Cambridge, MA: MIT Press.
- Bruni, A., Pinch, T., and Schubert, C. 2014. Technologically dense environments: What for? What Next? *Tecnoscienza: Italian Journal of Science & Technology Studies*, 4(2): pp. 51–72.
- Coletta, C., and Kitchin, R. 2017. Algorhythmic governance: Regulating the ‘heartbeat’ of a city using the Internet of Things. *Big Data & Society*, 4(2): pp. 1–16.
- Coletta, C., Heaphy, L., and Kitchin, R. 2019. From the accidental to articulated smart city: The creation and work of ‘Smart Dublin.’ *European Urban and Regional Studies*, 26(4): pp. 349–64.

- Czarniawska, B. 2004. On time, space, and action nets. *Organization*, 11(6): pp. 773–91.
- Czarniawska, B. 2009. Gabriel Tarde and organization theory. In Adler, P. (ed.), *The Oxford Handbook of Sociology and Organization Studies: Classical Foundations* (pp. 246–267). Oxford: Oxford University Press.
- Czarniawska, B. 2012. Organization theory meets anthropology: A story of an encounter. *Journal of Business Anthropology*, 1(1): pp. 118–40.
- Dalsgaard, S., and Nielsen, M. 2013. Time and the Field. *Social Analysis*, 57: pp. 1–19.
- Dawson, P. 2014. Reflections: On time, temporality and change in organizations. *Journal of Change Management*, 14(3): pp. 285–308.
- Deleuze, G., and Guattari, F. 1987. *A Thousand Plateaus: Capitalism and Schizophrenia*. Minneapolis: University of Minnesota Press.
- Dourish, P. 2016. Algorithms and their others: Algorithmic culture in context. *Big Data & Society*, 3(2): pp. 1–11.
- Dubinskas F.A. (ed.). 1988. *Making Time: Ethnographies of High-technology Organizations*. Philadelphia: Temple University Press.
- Elden S (2004) Rhythmanalysis: An introduction. In Lefebvre H., *Rhythmanalysis: Space, Time and Everyday Life* (pp. vii–xv). London: Continuum.
- Felt, U. 2015. The Temporal Choreographies of Participation: Thinking Innovation and Society from a Time-Sensitive Perspective. In Chilvers, J. and Kearnes, M. (eds), *Re-making Participation. Science, Environment and Emergent Publics* (pp. 178–198). London: Routledge.
- Gherardi, S., and Strati, A. 1988. The temporal dimension in organizational studies. *Organization Studies*, 9(2): pp. 149–64.
- Gieryn, T.F. 2006. City as Truth-Spot: Laboratories and Field-Sites in Urban Studies. *Social Studies of Science* 36: pp. 5–38.
- Granqvist, N., and Gustafsson, R. 2016. Temporal Institutional Work. *Academy of Management Journal*, 59(3): pp. 1009–35.
- Heath, C., and Luff, P. 1992. Collaboration and control: Crisis management and multimedia technology in London underground line control rooms. *Computer Supported Cooperative Work (CSCW)*, 1(1/2): pp. 69–94.
- Hine, C. 2000. *Virtual Ethnography*. London: Sage.
- Kitchin, R. 2018. The realtimeness of smart cities. *Tecnoscienza: Italian Journal of Science & Technology Studies*, 8, pp. 19–42.
- Latour, B., and Hermant, E. 1998. *Paris: Ville Invisible*. Paris: La Decouverte.
- Lefebvre, H. 2004. *Rhythmanalysis: Space, Time and Everyday Life*. London: A&C Black.
- Marcus, G. E. 1998. *Ethnography through Thick and Thin*. Princeton, NJ: Princeton University Press.
- Mitchell, T. 2020. Infrastructures work on time. E-flux. <https://www.e-flux.com/architecture/newsilk-roads/312596/infrastructures-work-on-time/>
- Miyazaki, S. 2012. Algorithmic: Understanding micro-temporality in computational cultures. *Computational Culture* 2.
- Nowotny, H. 1992. Time and social theory: Towards a social theory of time. *Time and Society* 1(3): pp. 421–54.

- Orlikowski, W.J., and Yates, J. 2002. It's About Time: Temporal Structuring in Organizations. *Organization Science* 13, 684–700.
- Palmer, M., and Jones, O. 2014. On breathing and geography: Explorations of data sonifications of timespace processes with illustrating examples from a tidally dynamic landscape (Severn Estuary, UK). *Environment and Planning A*, 46(1): pp. 222–40.
- Rämö, H. 2004. Spatio-temporal notions and organized environmental issues: An axiology of action. *Organization* 11(6): pp. 849–872.
- Reinecke, J., and Ansari, S. 2015. When Times Collide: Temporal Brokerage at the Intersection of Markets and Developments. *Academy of Management Journal* 58: pp. 618–648.
- Roe, R. A., Waller, M. J., and Clegg, S. R. (eds) 2009. *Time in Organizational Research*. London: Routledge.
- Sonda, G., Coletta, C., and Gabbi, F. (eds) 2010. *Urban Plots, Organizing Cities*. Farnham: Ashgate.
- Star, S. L. 2002. Infrastructure and ethnographic practice: Working on the fringes. *Scandinavian Journal of Information Systems* 14(2): pp. 107–22.
- Star, S. L., and Ruhleder, K. 1996. Steps toward an ecology of infrastructure: Design and access for large information spaces. *Information System Research*, 7(1): pp. 111–34.
- Suchman, L. 1987. *Plans and Situated Actions*. Cambridge: Cambridge University Press.
- Urry, J. 1994. Time, leisure and social identity. *Time & Society*, 3(2): pp. 131–49.
- Van Maanen, J. 2011. Ethnography as work: Some rules of engagement. *Journal of Management Studies*, 48(1): pp. 218–34.
- Walker, G. 2014. The dynamics of energy demand: Change, rhythm and synchronicity. *Energy Research & Social Science*, 1: pp. 49–55.
- Weltevrede, E., Helmond, A., and Gerlitz, C. 2014. The politics of real-time: A device perspective on social media platforms and search engines. *Theory, Culture & Society*, 31(6): pp. 125–50.
- Whipp, R., Adam, B., and Sabelis, I. (eds) 2002. *Making Time: Time and Management in Modern Organizations*. Oxford: Oxford University Press.