

Designing and domesticating an interstructure: Exploring the practices and the politics of an elevator for cyclists

Ivana Suboticki 

Norwegian University of Science and Technology, Norway

Knut H. Sørensen

Norwegian University of Science and Technology, Norway

Abstract

Technologies called infrastructures are often considered to be inherently and opaquely political, but how they exert their politics has been both empirically and conceptually debated. Infrastructure studies have largely focused on (in)visibility or 'infra' qualities as central criteria for assessing who and what is included and excluded, and when. In this paper we argue that this binary is unproductive and propose the concept of *interstructure* to highlight the connective and aesthetic qualities of technologies as well as their political features. These features may be quite transparent but also ambivalent, which we demonstrate by analysing an elevator for cyclists in Belgrade, Serbia. We draw on material semiotics to unpack the practices, the sense-making and the political work of this elevator in relation to its design and use. The analysis is based on interviews and an observation study. It shows that the elevator elicited substantial articulation work among most users as well as the operators who ran it. The elevator's politics were produced through continuous negotiations among actors with partial views. Unpredictable connections captured a clearly ambivalent politics. We conclude by arguing that similar political dynamics may be present in transport and urban technologies more generally and that the concept of *interstructure* offers a fruitful avenue to study them and their politics.

Keywords

infrastructure, interstructure, elevator for bicyclists, domestication, politics of technology

Urban Studies

1–16

© Urban Studies Journal Limited 2020



Article reuse guidelines:

sagepub.com/journals-permissions

DOI: 10.1177/0042098020910334

journals.sagepub.com/home/usj



Corresponding author:

Ivana Suboticki, Department for Interdisciplinary Studies of Culture, Norwegian University of Science and Technology, NTNU, NO-7491 Trondheim, Norway.

Email: ivana.suboticki@ntnu.no

摘要

被称为基础设施的技术通常被认为具有内在的和不透明的政治性，但是，关于它们如何发挥它们的政治作用，却一直存在实证和概念上的争论。一直以来，基础设施研究主要专注于它的（不）可见或“基础”性质，将这些作为评估何时、将哪些人、哪些内容包括在内或排除在外的核心标准。在本文中，我们认为这种二分法是无效的，并提出了中间设施 (*interstructure*) 的概念，以突出技术的连接性和美观性特征，以及它们的政治特征。这些特征可能很明显，但也很矛盾，我们通过分析塞尔维亚贝尔格莱德的一部自行车电梯来证明这一点。我们利用物质符号学来解释电梯的设计和使用中的行为、意义创造和政治工作。分析基于访谈和观察研究。分析表明电梯在大多数用户和操作者中引发了大量的衔接工作。这部电梯的政治是通过持不同观点的行为者之间不断的谈判而产生的。不可预测的联系捕获了一个明显矛盾的政治。我们的结论是，类似的政治动态可能存在于更广泛的交通和城市技术中，而中间设施的概念为研究它们和它们的政治提供了一个富有成效的途径。

关键词

基础设施、中间设施 (*interstructure*)、自行车电梯、驯化、技术政治

Received March 2019; accepted February 2020

Introduction: Exploring the politics of urban technologies

Transport technologies such as roads and bridges are critical to modern life. Often, they are conceptualised as *infrastructures*, as something ‘underneath’ that facilitates human activities. This characteristic is then used to infer that such technologies normally function seamlessly and invisibly to serve a common good. However, increasingly, scholars have been questioning this view (e.g., Star, 1999; Summerton, 2015) by critically exploring political characteristics of technologies considered as infrastructures, with an emphasis on their invisible exclusion features. This paper contributes by showing how the politics of technology are more comprehensive, complex and dynamic. However, this requires a focus on the features and effects of connections. The argument is developed through the analysis of a seemingly trivial piece of transport technology, namely an elevator for cyclists.

The scholarly attention to technologies ‘underneath’ has been described as the

‘infrastructural turn’ (Graham, 2010: 10). Infrastructures are then perceived as socio-technical objects with political qualities (e.g., McFarlane and Rutherford, 2008). Scholars therefore ask *how* infrastructure matters politically, pursuing Langdon Winner’s (1980) iconic question: ‘Do artefacts have politics?’ According to Winner, technologies such as infrastructures embody politics in their design. Political interests may be (intentionally or unintentionally) inscribed into artefacts to facilitate certain outcomes. A bridge, to use Winner’s example, may exclude certain users based on race or class in line with the political views of its designers while their machinations are rendered invisible. From this perspective, the politics of artefacts are malignant, which limits the scope of the analysis.

Winner’s analysis has been criticised by Joerges (1999), who asks the rhetorical question ‘Do politics have artefacts?’ He argues that Winner’s emphasis on the fixed, material embodiment of politics is too simplistic. It is not the bridge itself that discriminates or the designers who inscribe their

particular interests. Rather, we observe collective, ongoing processes where a wide set of actors may authorise, maintain and contest different orders of things. Thus, Joerges claims, we should study how these actors define what things do, since the politics are mirrored in the social relations between groups and organisations. Woolgar and Cooper (1999) offer yet another critique of Winner's perspective on the politics of infrastructure by asking: 'Do artefacts have ambivalence?' Their main argument is that artefacts, including infrastructures, are political in multiple and contingent ways. Thus, they also challenge the idea that a single political position unequivocally shapes technology in a linear manner.

However, as we show in the next section, there has been no closure of this debate. Thus, there is a need for further studies of the practices of relevant actors when they engage with technologies called infrastructure (Shove et al., 2015). In response to this, we offer an analysis of a modest but illustrative example – the only bicycle elevator in Belgrade, Serbia. Here, we show the gains of investigating not only the politics of the design of transport technologies but also the politics played out in the related sense-making and practices. We see this as an extension of the work on the politics of technology in general as well as with respect to mobility (Cresswell, 2010). This clearly is an area where the entanglement of movement, representations and practices interacts with politics.

The study of the elevator was undertaken as part of an analysis of the transport sector in Belgrade. We began to investigate this artefact because we were intrigued by the ambiguous ways it presented itself to the public. To begin with, it displayed a sign that read: *Elevator for cyclists*, which was written in both English and Serbian. Immediately below was another sign: *Use the elevator for cyclists*. On the elevator doors, there were

pieces of paper with additional instructions: *Working hours: 08h – 20.30h. Break: 13h – 13.30h*. Then further: *Stop!!! Strictly prohibited lift call, please wait lift-boy*. Clearly, these signs articulated a particular politics of the elevator, seemingly excluding people who were not cyclists and cyclists that arrived outside the working hours or during the lunch break, as well as requiring a lift-boy to operate the artefact.

However, from observing the use of the elevator, it became clear that the politics were more complex. When the first author saw a cyclist pulling up and waving to a man who came and pressed a button to open the doors, she asked if she could join too. The man replied: 'It's for cyclists'. 'Oh, ok', she answered both confused and surprised. He sighed, looked at her and then gestured at her to enter. Inside, the man turned a key, pressed the 'bridge' button and the elevator moved up, providing a nice view of the river, the old town area and the Kalemegdan fortress. As she exited with the cyclist, the man said to a couple trying to enter without bikes: 'You have to take the stairs. This is for cyclists.' The doors shut.

Initially, we thought of the elevator as an interesting urban technology because it was intended to facilitate biking, a sustainable but marginal mode of transport in Belgrade. It was clearly designed as a part of what usually is called a bicycle infrastructure (e.g., Caulfield et al., 2012; Furth, 2012; Morgan, 2019) that again is a part of the local transport system. However, it was not seamlessly integrated. The elevator was operated by city employees during the day-time only. Access appeared to be negotiable. In this sense, it seemed to be the centrepiece of a complex of practices related to its staffing, its working hours, the access that was offered and the relations to the surrounding communities. This raised questions about the politics of this elevator and its operation. Arguably, this indicated the presence of actors

authorising, maintaining and contesting order (Joerges, 1999) but also an ambivalence (Woolgar and Cooper, 1999) of the elevator. However, we felt we needed different conceptual tools to understand in detail the complex interactions where the elevator was the centrepiece. In the next section, we offer a different way of reasoning around the issue of the politics of transport technologies.

Analysing and identifying the politics of technology

The interest of science and technology studies (STS) and urban studies in the politics of technology owes much to the efforts of the late Susan Leigh Star to unpack the political and transformative powers of, in particular, information infrastructures. Star (1999: 381–382) defines infrastructures as sociotechnical configurations that are embedded in wider structures, standards and community conventions. Technologies are political because they are reality-shaping tools (see also Busch, 2011; Timmermans and Epstein, 2010). However, according to Star, this shaping (or ordering) is not a given. It is situational, depending on relations of which the technologies are part. In other words, agency is not intrinsic to artefacts but formed in the relation between different actors in a specific setting. Because people learn or embody such technologies through community membership and routinised practices, they are profoundly part of human identities and sense-making. In effect, the politics are standardised, learned and embodied differently by social groups (Star, 1990, 1999).

The related political work underlying the seeming invisibility of technologies is then identified by exploring who they serve and who they exclude. Infrastructures primarily become visible to those who do not ‘fit into’ them. Thus, they have to do so-called articulation work ‘that gets things back “on track”

in the face of the unexpected and modifies action to accommodate unanticipated contingencies’ (Star, 1991: 275). Lampland and Star (2009: 17) explicitly correlate ‘working’ or ‘good’ infrastructures with invisibility, and visible qualities with breakdown or disruption.

Several scholars challenge this emphasis on (in)visibility by criticising the normative implications of connecting well-functioning societies and infrastructures to seamless and undisrupted flows. Dalaklogou (2016), for instance, perceives the focus on non-disruption as an idealised and privileged analytical position. McFarlane (2010) stresses that disruption does not categorically equal failure. Rather, expectations that infrastructures work seamlessly further global inequality. Howe et al. (2016) emphasise the inherently paradoxical aspects of infrastructures: they simultaneously construct and deconstruct, are solid and fragile, and mitigate as well as construct risk, while Lawhon et al. (2017) criticise the tendency towards universalism in infrastructure studies.

Furthermore, the analytical role of (in)visibility has been contested empirically by highlighting how breakdown and disorder may be a normal part of everyday life (Chu, 2014; Dalakoglou and Kallianos, 2014; Graham, 2010; Silver, 2015). Visibility is sometimes even used strategically to make infrastructures serve specific needs (Kallianos, 2017; Trovalla and Trovalla, 2015; Velho, 2017). Thus, the visibility of infrastructures is not an anomaly pertaining only to excluded groups but a central aspect of how such technologies are made to work.

To sum up: while one strand of the reviewed literature argues for an exploration of the hidden politics of technology, a second strand explores the visible and disruptive character of technologies and how this complicates their political role. The disagreement seems to emerge from the use of the

concept of infrastructure to analyse different technologies in diverse contexts. Star's work emerged from an interest in information infrastructures, which tend to be much less visible than, for example, transport technology. Of course, Star's concern that technologies may exclude is relevant also to transport (Summerton, 2015). However, there are other political aspects of transport technologies to consider. Importantly, Shove et al. (2015: 280) remind us that many infrastructures are connective; they link people and places in ways that reflect political values and political work. Based on this observation and wanting to avoid a limiting reference to (in)visibility, we propose to analyse transport technologies as *interstructures* rather than *infrastructures*. This means that we address the politics of *connecting* technologies in the context of transport.

By interstructures we mean technologies or assemblages of technologies that primarily are designed and used to connect people and places in ways that are co-produced with politics that shape the technologies, their maintenance and use. Thus, interstructures are political in potentially complex and dynamic ways, since connectivity obviously is a political and value-laden issue. Connectivity is not just a question of accessibility or visibility. Interstructures are experienced through design and use, and they are sites of contingent interactions, negotiations, flows, ruptures, regulations, emotions and identity-making.

Previous studies highlight the need to juxtapose analyses of design and use and the interaction of people and artefacts (e.g., Dant, 2005). Rationales for design of urban materiality such as bicycle lanes shape mobility practice (Koglin, 2017; Koglin and Rye, 2014) while cyclists influence existing physical structures through their use (Latham and Wood, 2015). To engage in such exploration of an interstructure such as the bike elevator we use the material-semiotic concepts of

script (Akrich, 1992), programme/anti-programme (Latour, 1992) and domestication (Sørensen, 2006). Together, these concepts facilitate the analysis of complexes of designer–technology–user relations to identify the politics of transport interstructures.

The analysis of inscriptions of users and use identifies the *intended* politics of an artefact. Madeleine Akrich (1992) argues that designers in their designs 'define actors with specific tastes, competences, motives, aspirations, political prejudices and the rest, and they assume that morality, technology, science and economy will evolve in particular ways' (1992: 208). Such scripts shape technologies. However, the *enacted* politics are a different matter. The politics of interstructures are malleable and may be (re)shaped through everyday practices (see, e.g., Graham and McFarlane, 2015; Oudshoorn and Pinch, 2003). Bruno Latour's (1992) concept of programme/anti-programme highlights how designers inscribe programmes of action to make users behave in the intended manner and, conversely, how users may counter this through anti-programmes of actions, employing the technology differently by consciously circumventing the designers' programmes. Designers may in turn sidestep such moves by amending the original programme (script), users may again try to bypass the amended programme and so on. Hence, the politics of artefacts are produced through long-lasting interaction of intentions and enactments.

We chose to employ domestication theory (Sørensen, 2006) to further enrich the analysis of the construction of practices and the negotiation of meanings in relation to the elevator for cyclists. At the core of the approach is the idea of 'the active user' who through her/his use practice may go beyond designers' intentions. Domestication involves assembling human and non-human elements to embed socio-technically an artefact or a set of artefacts in a given setting. In the

processes, actors make sense of these objects and attach meaning to them. Such production of heterogeneous assemblages entails the making of links to other artefacts, other practices and other people, as well as engaging in interpretative and organisational efforts. Furthermore, in most cases people domesticate technologies in order to achieve something, such as performing new tasks or improving a particular practice. When people need to be aligned in their use of a technology, domestication may require orchestration. Such collective domestication may require little coordination when the users belong to a moral community of people who mainly share values and aims (Ask and Sørensen, 2019). When goals and preferences differ, managerial interventions of some sort may be required, such as instigating negotiations and command and control efforts.

In this paper, we look for collective domestication efforts to explore the alignment of the politics of the elevator for cyclists. Drawing on the material-semiotic concepts of script, programme/anti-programme and domestication, we analyse how the interstructure of the bike lift enables and constrains enactments. First, rather than just looking at how order is achieved through standardisation (e.g., Star, 1991, 1999), we study how order is achieved through meaning ascribed to material objects (Akrich and Latour, 1992). Second, and in line with the arguments of Joerges (1999) and Woolgar and Cooper (1999), the three material-semiotic concepts guide the exploration of the negotiations, protests and changes of the politics of interstructures through their use.

Method

The paper analyses the elevator for cyclists located next to the Sava River in Serbia's capital city Belgrade. Belgrade is located at the confluence of the Sava and the Danube

and the riverbank is a popular recreational area for Belgradians. The bicycle routes along the riverbank are the oldest in the city and the most popular among recreational cyclists. The elevator was built in 2005 and connects the 13 meter high Branko's Bridge crossing with the promenade beneath it. At this location, it connects the cycling lanes on both sides of the Sava River and provides passage for cyclists who travel from New Belgrade to the old city centre. Moreover, the elevator lies at the junction of European Eurovelo routes. Today, it remains the only operational elevator among the six city bridges. Three additional shells for elevators for cyclists have been built into the Ada Bridge in 2012 but are not yet operational.

Initially, we wanted information about how and why the elevator at Branko's Bridge was constructed and how it worked in its everyday setting. In turn, we also asked about the interpretation of and the engagement with the technology, including the activities it needed to remain operational. The first author conducted interviews with the main initiator of the elevator who is both an engineer and cycling activist, Mirko Radovanac, and its chief architect, Milutin Gec, in order to understand the design process. Both interviews were audiotaped and transcribed verbatim. She also conducted short phone interviews with a representative from the Directorate of Roads that has jurisdiction over the elevator and with one representative from the private management company responsible for its maintenance. In addition, she collected media reports about the elevator and reports from activists' online websites.

Furthermore, she undertook an observational study of the elevator for ten days during the period 12 September–3 October 2016, taking notes about how the elevator was used (or not) and the interaction between users, the elevator, the operators and other

actors. Brief interviews were conducted to elicit users' opinions about the lift and how they used it, to illuminate how it was domesticated. Most of these conversations were short – a couple of minutes; some lasted 10–15 minutes. Around 200 people were interviewed. Additional informal talks were conducted with four operators – Sale, Mile, Vlada and Milos (pseudonyms). All interviews were undertaken in Serbian and recorded through detailed field notes. Quotes used in the analysis were recorded in the field notes and later translated into English by the first author.

Next, the first author wrote a report in English describing findings, which the authors discussed and analysed. The combination of observation, interviews and media reports provided a rich dataset to 'de-scribe' (Akrich and Latour, 1992: 259) the elevator in its particular context. To 'de-scribe' means to entangle the inscriptions, re-inscriptions and anti-programmes that constrain and enable different meanings and interactions around the elevator, constituting a complex domestication dynamic.

We present the empirical analysis in two parts. The first explores how the elevator came to be. We specifically focus on the meanings and concerns that the designers found most salient when constructing the elevator and their implicit assumptions about future use and users. This illuminates the intended politics of the artefact. The second section presents the analysis of user accounts and observations about use to understand the domestication of the elevator as well as its enacted politics.

Designing an ambivalent elevator

From the start, the initiators conceived of the elevator at Branko's Bridge as a facility for cyclists. In this sense, the intended script and politics of the elevator appeared exclusive. This intention may seem surprising,

since in 2005 only 0.55% of the daily commuting trips in Belgrade were taken by bicycle (Kopf, 2014: 120). The idea of the elevator was first voiced publicly by Mirko Radovanac, a traffic engineer and cycling activist who had fought to improve the city's cycling facilities since the 1970s. According to Mirko, the elevator would give cyclists safe passage between two popular recreational areas on both sides of the Sava River. Thereby, it would constitute an alternative to an otherwise 'inhumane route' that, as Mirko phrased it, required cyclists to jump over a train track and two tram tracks, cross two streets, climb three flights of steep stairs, all while carrying their bike. However, only after its being promoted at the second Bike Fest in Belgrade in 2002 and additional lobbying by Mirko, did Belgrade's Mayor and the Land Development Agency give the project a green light. At the second Bike Fest about 3000 cyclists demonstrated their support for the bike lift. As Mirko recalled, after the Yugoslav and Kosovo wars and the political turmoil of the two previous decades, the new political leaders were eager to build new relationships with their citizens.

Milutin Gec was appointed as chief architect. He began by suggesting several key features of the design. It should be a transport elevator that could carry six cyclists and their bicycles, with sliding doors on both sides to allow easy entering and exiting. Later, a label was added, saying 'Elevator for cyclists'. However, as noted in the introduction, the script was not that exclusive. According to both Mirko and Milutin, the design was not meant to exclude other user groups. However, people with children and strollers and in wheelchairs, the elderly and pedestrians in general were not lobbying for the elevator; thus, they were not explicitly targeted by the design. Nevertheless, Milutin and Mirko implied in the interviews that they considered that anybody without a motorised vehicle could use the elevator,

emphasising its role as a connective artefact, as an interstructure. In principle, the final choice of an elevator that could fit 24 people and carry a load of 1800 kg did not include any material constraints against other users.

Like many infrastructure studies (e.g., Edwards, 2003; Knox, 2017; Larkin, 2013), we observed that the construction of the elevator in Belgrade was tied to symbolic and affective meanings pertaining to its politics. Mirko described the elevator as an important symbol of change in the city's modal status as it represented the modernisation of a deteriorating urban fabric and the Europeanisation of Belgrade. The location of the elevator at the intersection of two Eurovelo routes made it a node in the wider effort to reconnect Serbia with Europe through the European cycling corridors, another political feature.

Moreover, the architect emphasised the importance of aesthetics and scripted the elevator to look elegant. Milutin saw Branko's Bridge as one of the most beautiful in Belgrade. 'It is very elegant, it crosses Sava in one line. I didn't think myself worthy to destroy its beauty. That's why I thought that covering the elevator in reflective glass would not diminish it's [the bridge's] beauty.' To make the elevator add aesthetic value, he suggested a transparent and minimalist design to complement the bridge and give users a panoramic view. To realise this idea, he chose the smallest transport elevator available on the market (1.7 m × 1.7 m) that was not 'uselessly small', as he described it. With the structural engineer, he decided on a freestanding steel structure that, as Milutin explained, elegantly integrated with the bridge. The shell was covered in reflective glass carefully selected by the architect and the subcontractor to cater to the 360° view, to mirror the bridge and its surroundings in daylight and to be transparent at night. Milutin's emphasis on aesthetics thus meant to inscribe the tastes of users. They should

take notice and be thrilled by the elevator's and the city's beauty.

An important design decision was the choice of a hydraulic machine system that propelled the elevator upward. In this way, the motor was below the ground and did not obstruct the view from inside the elevator and the bridge's overall aesthetic. It also helped the project to stay within the budget. The economic constraints (around 18,000,000 RSD at the time, ~200,000 €) limited Milutin's freedom of scripting. In retrospect, he said in the interview, a hydraulic system was the economically optimal option. According to the Director of the Land Development Agency, this system was also the safest, as the elevator could be lowered securely in case of the relatively frequent power outages (Janjic, 2005).

To further ensure the safety of the elevator and its users, they employed operators (also referred to as companions, technicians or lift-boys). Even though Mirko would have preferred surveillance cameras, Milutin and the local administration opted for a 24/7 operator. Given the low labour costs, the high purchase and maintenance costs of cameras and their vulnerability to vandalism, it seemed rational to employ operators. To cater to the needs of the operator, extended features included a portable toilet and a small shed for shelter.

In the end, the elevator's intended role went beyond being a functional interstructure for people and bicycles; it was meant to be an aesthetically pleasing interstructure co-produced with a politics of taste. The more mundane concerns related to safety and robustness added to a rather complex script where agency was delegated to both human and non-human actors. The physical design enabled access for a variety of user groups, including their non-motorised material companions (bicycles, rollerblades, etc.), with little capacity to pay (use was free of charge). The elevator's constraining

attributes were the limited number of users (6 cyclists or 25 pedestrians), the maximum weight load (1800 kg), possible manifestations of disruptive behaviour (the need to have an operator at the scene) and the restricted opening hours (decided by the Directorate for Roads). The operators should prevent vandalism and provide supplementing programmes of action such as controlling users, teaching them how properly to engage with the elevator. Thus, the operators should curb any anti-programmes produced by potential users.

The scripting of the elevator, its intended politics, appeared to make it ambivalent. It was meant to be an aesthetically pleasing interstructure, connecting the space below the bridge with the road on the bridge. The elevator seemed to be open to all non-motorised people, but it was built as a response to demands from cyclists, whom the operators considered privileged users. It was envisioned as a technological fix to a topographical problem and with an operator to safeguard its operation. Like Woolgar and Cooper (1999), we find a clear ambivalence in the politics of the interstructure but, in the case of the elevator, we see how such ambivalence intentionally may be inscribed through the design. How did this play out in practice when the elevator was used? How did the ambivalence affect the domestication of the elevator?

'Real' users and their anti-programmes

On 1 September 2005, the first elevator for cyclists in Belgrade opened. A decade later, when our study was done, the elevator was already domesticated in the sense that it was used extensively and attributed meaning. This is nicely illustrated by the field notes from one summer day in 2016, which describe the area around the elevator as being full of adults walking, jogging, cycling

and fishing, while children were playing. At the patio next to the elevator, a group of people sat and talked to the operator. A fishing rod was put up and secured by some stones and an improvised barbeque was placed next to the blue shed where the operators could rest. When a cyclist approached the elevator, the operator got up from his chair and opened the door for the cyclist. Instead of joining the ride, he simply turned a key to let the cyclist go up and returned to his seat. A few moments later, a pedestrian approached the elevator but the operator ignored him. He read the signs on the door but seemed confused. Eventually, he walked away.

From the observations and the interviews, we learnt that a multitude of anti-programmes challenged the scripts of the designers and made the politics of the interstructure complex. To begin with, the elevator's hydraulic pump and other systems such as the buttons and sensors occasionally resisted the initial programme of action. The most persistently resisting component was the hydraulic pump. Frequently, it failed because of overheating of the oil. Then, it would take about 72 hours to cool down. In the summer months, when temperatures may rise to 30–40°C, overheating occurred frequently. Two air conditioners had been installed, one in the engine room and one in the cabin room, but they were insufficient. Since overheating was related to the frequency and load of use, and the numbers of cyclists were growing, the operators were more restrictive with access during warm weather. Thus, the politics of the interstructure had to allow for uncertainty of operation.

Operators also explained interruptions as due to deteriorating mechanical parts, which could take several weeks or months to replace. When potential users were asked what they thought about the elevator, the most common answer was: 'It's great when

it works!' Its functionality appeared unpredictable. Users said they never knew if the elevator would be shut down for a few minutes, days or months. At times, there were also exchanges at online cycling forums when users tried to acquire new information regarding whether the lift was operational. Thus, it was domesticated as an unreliable artefact and in need of actions that could modify the given contingencies such as 'articulation work' (Star, 1991).

The operators were expected to discipline users but they did not do this unequivocally. To some extent, they were contesting their inscribed agency as well as the anti-programmes emerging from the elevator and the users. To them, the elevator was not merely an instrumental interstructure; it was their second home and livelihood. This added affective features to the interstructure, beyond the frustrations among users. The operators domesticated the elevator as closely as they could to the designers' script, while simultaneously aiming to create a secure, liveable and workable environment for themselves. Community relationships were important to this domestication process. Sale, the youngest of the interviewed operators, explained how most of them were already part of the same community, mainly men who spent their days fishing in the river. 'We all know each other, we're fishermen', Sale explained. During her observation periods, the first author saw that also several neighbours were frequent visitors as well as a few stray dogs. All the operators stressed that they strived to create a space for themselves where they could have a sense of wellbeing and comfort.

In this environment, the operators found it demanding to discipline all users and to continually explain how the elevator worked and for whom it was intended. Although they claimed to create a safe public space for its users, in practice their actions often led to frictions and arguments with users. This

could make both parties annoyed or even angry. To minimise this hassle and reduce the need for interventions, they consistently tried to re-inscribe disciplining features into the elevator, attempting to make the politics of the interstructure technologically mediated. The additional pieces of paper with instructions posted on the entrance were examples of this. To the operators' frustration, such efforts to re-programme the elevator rarely had the desired effect. The field notes describe how, after yet another user did not follow the instructions, one operator got aggravated and said: 'I really don't understand what's not to understand!' Indeed, several of the operators considered the instructions clear and the failure to follow them as incomprehensible. Nevertheless, to potential users the access to the elevator and its status as a public space remained unclear.

One of the most controversial responses to users' anti-programmes was the operators' insistence on reducing pedestrians' use of the elevator. The interviewed operators explained this with the need to minimise the risk of overheating and to make their workload tolerable. They also thought such mitigation to be in line with the elevator's original script as an interstructure primarily for cyclists. Still, mitigation was difficult. The operators' instructions stipulated that the elevator should be kept open for all users and limited to trips at 5–15 minute intervals. However, according to operator Mile, such low frequency was impossible to achieve. One day, he showed the first author the long queue of people waiting to enter the elevator and told her to imagine how she would feel if the queue was 100 m long. Mile claimed that it was impossible to ask people to wait. 'We would be lynched!' he said. Efforts to re-script the elevator produced a dynamic, opaque and unpredictable politics of exclusion.

During her observation periods, the first author seldom saw operators consistently

denying access to pedestrians. The operators' friends, people who might have looked confused, people accompanying bikers and those who started to argue could all be allowed access. However, quite a few pedestrians were turned away. The criteria for rejection were unclear. There was an intricate interplay of operators changing opinion about who a 'real' user was, the operator's mood and his assessment of the risk that the elevator would fail, or that an unpleasant argument might occur. Situational, affective and sense-making features may therefore be important in determining the accessibility of interstructures and the connection they make, and thus features of their politics.

The interviewed cyclists, especially those taking part in cycling activist networks, described the elevator as a signifier of changing priorities in the city's modal strategy, expressing openness to public participation in urban development. However, their critical reactions were probably more representative of the politics of interstructures. The first author observed cyclists complaining about access problems, such as having to wait for the operator's lunch break to end, about shortened or unpredictable opening hours, about not being able to use the elevator without operators, and about having to put their shirts on when using the elevator (some elderly ladies had complained about indecent attire among cyclists). A handful of interviewees also complained about the operators' hygiene and level of intoxication. Often, the cyclists expressed these grievances by shaking their heads, rolling their eyes or making general comments about the illogical or unconcerned management of public property by the government and the operators. For instance, cycling activists said that they invested considerable energy to make the city administration change the programme for running the elevator to improve accessibility. One activist from the NGO 'Streets for Cyclists' told how he was rather

distraught by the need to lobby for a whole year to change the 'completely illogical' working hours.

Otherwise, the interviewed cyclists told us that they were rather pleased with the elevator as long as it was in working order. Several of them also understood the need for an operator to prevent vandalism. Cyclists who used the elevator regularly seemed to develop a good relationship with the operators, greeting them in a friendly way. Operators could also just nod to cyclists they knew or say 'just go' to those cyclists who were free to use the elevator on their own. Established relationships between cyclists and operators thus minimised the need for negotiation of access to the elevator while seamless passage with the elevator was dependent on other variables such as weather, elevator technology and other users.

Pedestrians were a third, rather outspoken group of users. In the interviews, they claimed that they should have access to the elevator since it looked like any other elevator and since they perceived it as a public, not an exclusive space. Most of them could not understand why they were denied right of entry or told to follow specific instructions. The first author observed several pedestrians just going ahead and pushing the call button or entering together with cyclists without asking permission. In these situations, the operators either just ignored them or, as several pedestrians reported, got very angry and yelled at them. On several occasions, the first author observed that operators tried to negotiate with the users: 'Don't you see that you can't use it?!' In yet other cases, pedestrians were observed actively negotiating access by arguing, pleading and giving ultimatums, with varying success.

Sale and Vlada articulated the operators' point of view, claiming that they found the behaviour of pedestrians to be typically Serbian; they just do not care about any

norms and rules. Similarly, some of the interviewed pedestrians saw the operators as self-interested and unfair workers, typical of Serbia. They would say to the operators that 'I see the signs, but I just don't understand them' but it did not occur to them that the operators cared for the elevator and tried to minimise use for reasons other than their own personal interest. The pedestrians' negative interpretation of the operators' affect and the belief that the elevator ought to be accessible to everybody, shaped their often critical view of the elevator. Overall, the elevator seemed to elicit emotions; it was an affective interstructure.

Another group significantly linked to the elevator was the previously mentioned neighbouring community of anglers, neighbours and dogs. Unsurprisingly, they were of no concern in the design of the elevator, but the operators described this broader community as important for their wellbeing. The community domesticated the elevator by extending social interaction and providing support to the operators. They would drink beer, fish and socialise throughout the day. For the operators, it was also reassuring to have access to help nearby in the case of malfunction or confrontation with aggressive users. Several interviewed members of the extended community told that the elevator and the operators were good company. One fisherman explained that most operators were fishermen too and 'fishermen are good people'.

Thus, the observations showed that the way programmes and anti-programmes played out in the everyday setting was continually shifting. These shifts were caused by a heterogeneous set of connections that were made and unmade in a manner where the described material programmes and anti-programmes were just repeated. Thus, the politics of the elevator were unstable but, disregarding technical problems that could render the elevator out of order, the

instabilities appeared to be manageable. Probably, both the operators and the potential users seemed to accept a situation where they had to be prepared for navigational challenges.

To summarise, the elevator was an interstructure that offered contingent access as well as community, which elicited a wide range of emotions from those who partook in its domestication. The elevator was the centrepiece of a dynamic public space which also made it susceptible to a continuous influx of new users who continually re-domesticated it. This affected its politics, which continued to be shifting, heterogeneous and multivocal.

Conclusion: The social and political life of interstructures

Initially, we thought that the main benefit of using the concept of interstructure was the implied focus on connections as the dominant rationale of technologies that move people and things from one place to another. This benefit was clear with respect to the analysis of the elevator for cyclists. Both the operators and the potential users were mainly concerned about whether they could be lifted from the river to the bridge or the reverse. However, our analysis also demonstrated that interstructures may have other important qualities that influence their achievements and how they are perceived, not least as a centrepiece of the social life of one or more communities. This also results in political assessments.

Of course, the main feature of interstructures is the kind of connections they offer and the access to these, but they are not simply physical artefacts that move or help move people and goods. Connectivity is a sociotechnical achievement. We argue that interstructures have to be understood as heterogeneous assemblages pertaining to the alignment and dis-alignment of practices,

their semiotics – the meanings and interpretations made by a variety of user groups, the temporality of actions, including degrees of orchestration and access, emotions produced through interactions of people and the material and lastly, spatial issues such as the direct connections of physical places and with other interstructures. This is not an exhaustive list. Moreover, not all features are relevant in every case. Still, the list contains aspects that may be critical to the concrete enactment of connectivity. Thus, it demonstrates the potential complexities that the concept of interstructure is meant to make transparent.

Admittedly, the elevator for cyclists is a particular case because of its modest scope; maybe also because of the richness of the interactions that take place and the instabilities of the domestication process. However, many transport technologies share at least some of the characteristics that we have highlighted. Bridges often have remarkable aesthetical qualities, highways become crowded more or less regularly and may be partly interrupted by repair work, roads may be shared by users of different modes of transport, and airports allow for a multiplicity of interactions. Many interstructures provide for transient communities, for example as a result of queuing but also because bridges, squares and streets are places where people meet. When interstructures limit connectivity, as we have seen, they also elicit affect and sometimes drama. This is often because, as previously mentioned, they are expected to be public spaces seamlessly serving the public good, while failing to meet such expectations.

The case of the elevator also suggests that constraining and enabling features of interstructures may be continually shifting; thus, introducing contingency of connections and interaction as a potentially important feature. In turn, this means that articulation work may be a recurring feature of

interstructures and not just an issue related to exclusion and opacity. In the case of the elevator, no group or actors were categorically protected from breakdown and confusion or from interaction with other actors. Accordingly, everybody needed to do articulation work sometimes but nobody needed to do such work all the time. We do not think this is a special feature of the elevator for cyclists. Rather, we claim that attending to a broader set of concerns other than just matters of access (degrees of inclusion/exclusion and of visibility/invisibility) provides a better understanding of the diverse achievements of transport technologies and their dependencies.

The politics of the elevator were, as we have seen, fluid and characterised by multiplicity. This was partly due to an ambivalent script. The elevator was intended to support cyclists and symbolise a modern Belgrade while subjected to political-economic considerations, for example, regarding costs, capacity, the need for operators, and its time of operation during the day. Access was not uniformly inscribed; in practice it was contingent and influenced by many factors. Thus, the elevator was not shaped by a singular political vision in the way Winner (1980) describes. Neither was it just mirroring existing social relations (Joerges, 1999). Rather, as we have seen, there were constantly new negotiations about the politics of the elevator. The fluidity of its politics was also caused by the circular, seemingly never-ending dance of the programme of action of the operators and the anti-programmes of the users.

In turn, this meant that the domestication of the elevator produced contingent and shifting practices and multivocal sense-making. Arguably, the domestication was a collective enterprise because it included elements of decentred orchestration, of interdependence. Operators adjusted to users, users adjusted to operators and to each other. However, domestication was not collective

in the sense of Ask and Sørensen (2019), where actors either needed to agree on aims and means or they needed management to coordinate their activities. In the case of the elevator for cyclists, there were no such stable moral agreements but no stable management either. Thus, the analysis of the collective domestication of the elevator confirmed that its politics were ambivalent. However, this was more clearly the result of the exercise of agency than what Woolgar and Cooper (1999) observe, mainly because it involved orchestration of multiple partial views. Probably, the domestication of most interstructures displays similar qualities but maybe not with such frequent shifts. We think of this as a perpetual collective domestication process, partially dis-aligned to emphasise its shifting and weakly coordinated character.

The complex and partial alignment of multiple values, goals and interests in the elevator proved necessary for its construction. Still, it is noticeable how the dynamic set of actors shifting between being aligned and dis-aligned continued to be an important source of support and care for the elevator in its everyday life. To public officials and transport planners, this represents valuable lessons for future developments. Above all, it is important to reflect on the possible consequences of supplementing a view of instable interstructures as problematic with a recognition that the situation may result in an interplay of care and disruption, produced through various connections of human and non-human actors that want the interstructure.

These observations may also have implications for urban planning, above all with respect to the contingencies of care and disruption without labelling the interstructure a failure. The elevator is an example of a well-intended design, which resulted in the engagement of a much broader group of users than originally intended. Thus, the

planned capacity was too small. Clearly, interstructures are attractive, especially when they are part of public spaces, perhaps more so than planners may realise. Thus, one important potential gain from turning to the concept of interstructure is to change the focus of planning from (in)visibility, standardised operations and stability towards including also an interest in sense-making, multiple uses and negotiated processes. A sensibility towards perpetual collective domestication should also be helpful when considering the benefits from considering the actions of users as a form of continuous public engagement. A working interstructure is not dependent on having users with similar practices and sense-making as long as the users do not obstruct each other.

The critical scholar studying transport technologies may find our observations of the politics of interstructures as potentially fluid and shifting to be disappointing. The idea of a consistent political shaping of technology is tempting, not only to the critic but also to those who want what they consider as beneficial political views to be implemented. The latter group may see our study as a warning against assuming that seemingly benign policies will have positive outcomes when inscribed into new technologies. We may want to push for climate change mitigation and improved quality of urban environments, but we should be aware of the challenges involved in transforming such goals into the design and construction of new interstructures.

Acknowledgements

We are grateful for valuable comments from Vivian Anette Lagesen, Tomas Moe Skjølsvold, three anonymous reviewers and the editor.

Funding

The paper was funded by the Norwegian University of Science and Technology (NTNU), Faculty of the Humanities.

ORCID iD

Ivana Suboticki  <https://orcid.org/0000-0002-8808-0353>

References

- Akrich M (1992) The de-description of technical objects. In: Bijker WE and Law L (eds) *Shaping Technology – Building Society. Studies in Sociotechnical Change*. Cambridge, MA: The MIT Press, pp. 205–224.
- Akrich M and Latour B (1992) A summary of a convenient vocabulary for the semiotics of human and nonhuman assemblies. In: Bijker WE and Law J (eds) *Shaping Technology – Building Society. Studies in Sociotechnical Change*. Cambridge, MA: The MIT Press, pp. 259–264.
- Ask K and Sørensen KH (2019) Domesticating technology for shared success: Collective enactments of World of Warcraft. *Information, Communication & Society* 22(1): 73–88.
- Busch L (2011) *Standards: Recipes for Reality*. Cambridge, MA: The MIT Press.
- Caulfield B, Brick E and McCarthy OT (2012) Determining bicycle infrastructure preferences – A case study of Dublin. *Transportation Research Part D: Transport and Environment* 17(5): 413–417.
- Chu JY (2014) When infrastructures attack: The workings of disrepair in China. *American Ethnologist* 41(2): 351–367.
- Cresswell T (2010) Towards a politics of mobility. *Environment and Planning D: Society and Space* 28(1): 17–31.
- Dalakoglou D and Kallianos Y (2014) Infrastructural flows, interruptions and stasis in Athens of the crisis. *City* 18(4–5): 526–532.
- Dant T (2005) *Materiality and Society*. Maidenhead: Open University Press.
- Edwards PN (2003) Infrastructure and modernity: Force, time, and social organisation in the history of sociotechnical systems. *Modernity and Technology* 1: 185–226.
- Furth PG (2012) Bicycle infrastructure for mass cycling: A transatlantic comparison. In: Pucher JR and Buehler R (eds) *City Cycling*. Cambridge, MA: MIT Press, pp. 105–140.
- Graham S (ed.) (2010) *Disrupted Cities: When Infrastructure Fails*. New York: Routledge.
- Graham S and McFarlane C (eds) (2015) *Infrastructural Lives: Urban Infrastructure in Context*. New York: Routledge.
- Howe C, Lockrem J, Appel H, et al. (2016) Paradoxical infrastructures: Ruins, retrofit, and risk. *Science, Technology, & Human Values* 41(3): 547–565.
- Janjic S (2005) Lift za bicikliste. *Novosti*, 28 August. Available at: <http://www.novosti.rs/vesti/beograd.74.html:173480-Lift-za-bicikliste> (accessed 19 March 2018).
- Joerges B (1999) Do politics have artefacts? *Social Studies of Science* 29(3): 411–431.
- Kallianos Y (2017) Infrastructural disorder: The politics of disruption, contingency, and normalcy in waste infrastructures in Athens. *Environment and Planning D: Society and Space* 36(4): 758–775.
- Knox H (2017) Affective infrastructures and the political imagination. *Public Culture* 29(2): 363–384.
- Koglin T (2017) Urban mobilities and materialities – A critical reflection of ‘sustainable’ urban development. *Applied Mobilities* 2(1): 32–49.
- Koglin T and Rye T (2014) The marginalisation of bicycling in modernist urban transport planning. *Journal of Transport & Health* 1(4): 214–222.
- Kopf S (2014) When citizens become activists – Negotiating urban space in Belgrade. *Acta Historiae Medicinae Stomatologiae Pharmaciae. Medicinae Veterinariae* 33(1): 118–132.
- Lampland M and Star SL (eds) (2009) *Standards and Their Stories: How Quantifying, Classifying, and Formalizing Practices Shape Everyday Life*. New York: Cornell University Press.
- Larkin B (2013) The politics and poetics of infrastructure. *Annual Review of Anthropology* 42: 327–343.
- Latham A and Wood PRH (2015) Inhabiting infrastructure: Exploring the interactional spaces of urban cycling. *Environment and Planning A* 47(2): 300–319.
- Latour B (1992) Where are the missing masses? The sociology of a few mundane artifacts. In: Wiebe BE and Law J (eds) *Shaping Technology – Building Society. Studies in Sociotechnical Change*. Cambridge, MA: The MIT Press, pp. 225–258.

- Lawhon M, Nilsson D, Silver J, et al. (2017) Thinking through heterogeneous infrastructure configurations. *Urban Studies* 55(4): 720–732.
- McFarlane C (2010) Infrastructure, interruption, and inequality: Urban life in the global South. In: Graham S (ed.) *Disrupted Cities: When Infrastructure Fails*. New York and London: Routledge, pp. 131–144.
- McFarlane C and Rutherford J (2008) Political infrastructures: Governing and experiencing the fabric of the city. *International Journal of Urban and Regional Research* 32(2): 363–374.
- Morgan N (2019) Cycling infrastructure and the development of a bicycle commuting socio-technical system: The case of Johannesburg. *Applied Mobilities* 4(1): 106–123.
- Oudshoorn NEJ and Pinch T (2003) *How Users Matter: The Co-construction of Users and Technologies*. Cambridge, MA: MIT Press.
- Shove E, Watson M and Spurling N (2015) Conceptualizing connections: Energy demand, infrastructures and social practices. *European Journal of Social Theory* 18(3): 274–287.
- Silver J (2015) Disrupted infrastructures: An urban political ecology of interrupted electricity in Accra. *International Journal of Urban and Regional Research* 39(5): 984–1003.
- Sørensen KH (2006) Domestication: The enactment of technology. In: Berker T, Hartmann M, Punie Y, et al. (eds) *Domestication of Media and Technology*. Maidenhead: Open University Press, pp. 40–61.
- Star SL (1990) Power, technology and the phenomenology of conventions: On being allergic to onions. *The Sociological Review* 38(S1): 26–56.
- Star SL (1991) The sociology of the invisible: The primacy of work in the writings of Anselm Strauss. In: Maines D (ed.) *Social Organization and Social Process: Essays in Honor of Anselm Strauss*. Hawthorne, NY: Aldine de Gruyter, pp. 265–283.
- Star SL (1999) The ethnography of infrastructure. *American Behavioral Scientist* 43: 377–391.
- Summerton J (2015) Those who are not served? Exploring exclusions and silences in transport infrastructures. In: Bowker GC, Timmermans S, Clarke AE, et al. (eds) *Boundary Objects and Beyond. Working with Susan Leigh Star*. Cambridge, MA: The MIT Press, pp. 459–472.
- Timmermans S and Epstein S (2010) A world of standards but not a standard world: Toward a sociology of standards and standardization. *Annual Review of Sociology* 36: 69–89.
- Trovalla U and Trovalla E (2015) Infrastructure turned suprastructure: Unpredictable materialities and visions of a Nigerian nation. *Journal of Material Culture* 20(1): 43–57.
- Velho R (2017) *Fixing the gap: An investigation into wheelchair users' shaping of London public transport*. PhD dissertation, University College, London, UK.
- Winner L (1980) Do artifacts have politics? *Dædalus* 109: 121–136.
- Woolgar S and Cooper G (1999) Do artefacts have ambivalence: Moses' bridges, Winner's bridges and other urban legends in S&TS. *Social Studies of Science* 29(3): 433–449.