Blyth, Pascale

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Of Cyberliberation and Forbidden Fornication: Hidden Transcripts of Autonomous Mobility in Finland

Pascale-L. Blyth

Department of Built Environment, School of Engineering, Aalto University, Finland

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ABSTRACT

While autonomous mobility technology is developing, comparatively less is known about how a sociotechnical system of autonomous mobility may impact our urban living conditions. Using Finland as a case study, this research aims to identify the possible implications of changing power relations created by autonomous mobility technology. This study uses a theoretical and conceptual approach grounded in the planning research tradition of Aristotelian practical judgement (phronesis). Drawing from political theory of technology, it investigates the social relations that may be afforded by autonomous mobility technology. Adapting a concept drawn from geography of power, it examines how power is expressed in terms of transcripts of dominant technological agency and hidden social context. 31 interviews of extended users in the transition (intermediaries) revealed three dominant transcripts of technological agency associated with the philosophy of cyberlibertarianism (liberation of the driver, safety of the driver and customer accessibility), and four hidden transcripts of social context (restrictions on sharing street space, loss of social safety, vulnerability of passengers, and loss of privacy). The phronetic research tradition that was used in the study revealed several things. The impact of autonomous mobility technology goes beyond the purely systemic, affecting the very fabric of our connection with place and society. Failure to consider autonomous mobility technology as a sociotechnical system that will restructure society unperceptively (technological somnambulism) may bring profound societal changes.

1. Introduction

Autonomous mobility is characterized by a new era of emerging vehicle systems where part or all of the driver's actions may be removed or limited by means of a combination of powerful new technologies including sensors, computing power and storage, and short-range communications (SCC for short) (Baskar et al., 2011; Blyth et al., 2016; Leen and Heffernan, 2002; National Highway Traffic Safety Administration, 2013; Olariu and Weigle, 2009; Ozguner et al., 2011). While there are many models, they are all part of a new era of networked urban systems based on ‘big data’ (Kitchin, 2017, 2014; Kitchin et al., 2017) that characterize ‘smart cities’. Self-driving vehicles (SDV) continuously gather and process large quantities of fine-grained data about each vehicle and its environment in real-time, using complex algorithms to process it into information, and sharing it with other vehicles and infrastructures. Data includes data on the vehicle and its environment (using LIDAR) to enable navigation and the prevention of accidents. It also includes data to enable mobility coordination such as traffic flow data, user travel choices and personal data, and for secondary uses such as taxation (Lee and Gerla, 2010; Olariu and Weigle, 2009).

E-mail address: pascale.blyth@aalto.fi.

1 Full postal address: Department of Built Environment, School of Engineering, Aalto University, PO Box 14100, FI-00076 Aalto, Finland.


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Autonomous mobility has the potential to quietly restructure our physical and social fabric in the long-term, and so much be considered as a sociotechnical system, not just a technology. Langdon Winner argues that it is important to examine the sociocultural context that constitutes the inner workings of technology (Winner, 1993, 1980). We consider autonomous mobility as a Large Technical System (LTS) that comprises numerous physical and institutional components, including infrastructure, data, organizations, knowledge, laws and many more that interact with each other in a way that is ‘socially constructed and socially shaping’ (Hughes, 2012). But we go beyond the LTS as binding us in a social and political contract as in the case of utilities (Rochlin, 2004) to consider autonomous mobility as a system with power expressed in domination, as Urry’s system of automobility (Urry, 2004). Urry noted how the specific character of domination of the car is not discussed, despite it being, in his opinion, more significant than other global technologies, including the computer. Urry refers to the car’s ‘specific character of domination’ as resulting from the interplay of six components: (1) The car is the most powerful manufactured object as it has defined 20th century economic theory. (2) It is the second largest item of individual, status-giving consumption. (3) It has complex and far-reaching links with other industries. (4) Its ‘quasi-private’ mobility has been superseding more public mobilities such as cycling and public transportation and reshaping household practices. (5) The car permeates culture of what constitutes the good life, from art to advertising. (6) It is the largest cause of environmental resource use (in terms of materials, space, power, roads, and externalities) that indirectly led to global wars (Urry, 2004).

The emergence of this system of autonomous mobility presents urban planners with unique practical, societal and moral challenges (Guerra, 2015). Reflected in a modernist perspective, a large share of autonomous mobility research is focused on the development of the technical systems underpinning it (Milakis et al., 2017) and national technology policy as a management tool (Fagnant and Kockelman, 2013). What is missing is an understanding of technology as a sociotechnical phenomenon (Mladenović, 2019). Recognizing the challenge to planning research autonomous mobility presents, this paper considers how it may reshape the urban environment and social relations, and how some groups may make gains and some lose out (Ballesteros et al., 2010).

Using the political theory of technology (Winner, 1993, 1980, 1978) as a starting point, this study utilizes a conceptualization of power drawn from the analysis of geographies of power, namely public domination and hidden resistance (Scott, 1990). This research investigates, explores and maps the transcripts of dominance and resistance expressed by the extended users from public, private and civil sectors involved in the Finnish autonomous mobility system transition.

This paper consists of four parts. The background section introduces the reader to the special Finnish techno-political context of autonomous mobility (the Finnish informational economy) and the expanded users in it. The theoretical framework draws from concepts of political theory of technology and presents them in a planning research context. It introduces a theoretical conceptualization of power as domination by technology and hidden impact (resistance) on the urban environment, both on place and people. The research design section presents the interview research methodology and the actors involved in the transition (the extended users or intermediaries) because they plan for or face using the technology in the urban environment. The findings section identifies and describes three dominant transcripts of agency (SDV technology as a tool for the SDV user agent) and their associated four hidden transcripts of social context (transformations in urban living around the SDV user agent) about autonomous mobility that emerged from interviewing extended users. Finally the conclusion sums up the main findings and their implications.

2. Background

In this section, it behoves to introduce the reader to the Finnish research context. Following international shocks in the early 1990s, including the collapse of Soviet trade, the globalization of capital and timber markets, Finland shifted from being an industrial to an informational economy2 focussed on emerging ICT technologies. Firms, financial institutions, universities (to leverage a highly educated workforce), and policy agencies concerted to adopt, diffuse, and use technology (Halme et al., 2014; Hyytinen et al., 2006; Ornston and Rehn, 2006, pp. 83–84). Several industries have emerged (e.g. Nokia in wireless technologies) and are continuously emerging in a ‘smart economy’ (Kitchin, 2017) around expertise in digital platforms3 (Halén et al., 2016). Policy measures to support the smart economy include favourable corporate taxation, liberalized regulation, favourable technology trials laws and easy data use. Competition and consumer protection laws are written with digital platforms in mind, while public procurement favours them. Organizational co-operation, opening public data and standardization are encouraged. Success stories about Finnish platforms and digital services are told, and new experts trained for the digital platform economy and service design (Halén et al., 2016).

A Finnish smart mobility industry, using emerging concepts such as Mobility-as-a-Service (MaaS)4 (The MaaS Alliance, 2016) and autonomous mobility (Temmes et al., 2014), would leverage the Finnish communications networks industry (especially 5G), high ICT use, monetize driver travel data and the large customer databases of banks and insurance companies. According to Kari Wihlman,

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2 For a definition of an information economy, see (Castells and Hall, 2000).
3 Digital platforms are big business—leveraging extremely large numbers of customers and revenue for corporations. Facebook, with Google, for example, controls well over half the online advertising market worldwide and has over 2 billion users (if users were a country’s population, it would be the third largest country in the world). Amazon takes almost half of all online spending in the US, selling over 200 billion USD worth of goods every year. Digital platform enabled corporations (such as Apple, the largest music platform in terms of revenue, and Google) are entering the SDV market rather than car manufacturers (McGuirk and McGetrick, 2017; Myer-Schönberger and Range, 2018). These developments are driving technology strategies internationally—for example, China is investing heavily at home and abroad in smart city technologies, including autonomous vehicles to become a financial, technological and political superpower (Segal, 2018).
4 Mobility-as-a-Service (MaaS), according to the MaaS Alliance, is ‘the integration of various forms of transport services into a single mobility service accessible on demand’ with single payment, typically through a mobile application (The MaaS Alliance, 2016).
Head of the Finnish Transport Agency, “There are huge possibilities in utilizing data and transforming them into services. The intention is to open more Transport Agency data for use by markets and enterprises. […] In global terms, we are talking about billions of euros. In the utilization of new kinds of mobility services, Finland could be a path opener.” (Sippola, 2018).

In Finland, in practice, the potential of smart mobility and its impact is unclear. Maas has been described as ‘a hyped socio-technical system’ (Giesecke et al., 2016) at this stage. The review by Tuominen et al. (2016) of 47 publications on mobility services found information to be piecemeal—focusing either on specific user groups, vehicles or trip types, greenhouse gas emissions, safety, transport performance or modal share. Noy and Givoni (2018) found there to be large unknowns for smart mobility entrepreneurs. Moreover, attempts in 2017 by the Finnish Ministry of Transport and Communications to reform road taxation and influence behaviours by using digital black boxes to tax private car use failed. Drivers were to share their location data and be rewarded with lower insurance costs for certain mobility behaviours; with obedient drivers receiving discounts; but the proposal was dropped after a public outcry (Sippola, 2018).

The development of the Finnish informational economy has similarities with Castells and Hall’s concept of the technopole (Castells and Hall, 2000) (p3). Cities are deliberately reshaped by processes such as technological revolutions, the formation of a new global economy, and the emergence of a new form of economic production based on recombining existing resources and adding knowledge. Castells and Hall (2000) argue that informational economies reshape cities and regions in many ways, good and bad. In the next section, we consider our argument within the following theoretical framework—that the emerging autonomous mobility system may have powerful consequences on the urban environment, that we are sleepwalking with the technology unwilling or unable to see how it is mundanely changing the world around us, including, in the urban environment, relations of power.

3. Theoretical framework

We firmly ground this analysis in the phronetic research tradition (Flyvbjerg, 2004, 2002) found in urban planning, ‘an approach to the study of planning based on a contemporary interpretation of the classical Greek concept of [Aristotelian] phronesis, variously translated as practical wisdom, practical judgement, common sense, or prudence’ (Flyvbjerg, 2004). Contemporary phronesis includes considerations of power as well as values. The main interest of phronetic research is to reveal contextual and embedded power issues related to planning agendas, such as the impact of technology, for the practical judgment (phronesis) of urban planners and other actors (Flyvbjerg, 2004, 2002). Phronetic research sets out to answer four questions of power and values, namely (1) where are we (planning researchers and actors) going? (2) who gains and who loses, and by which mechanisms of power? (3) is this development desirable? and (4) what, if anything, should we do about it? (Urry, 2004).

This study takes the phronetic research tradition and adapts it to the study of emerging autonomous mobility in the urban environment. In considering where mobility, and autonomous mobility are going, we contend that the major focus of modern mobility thinking is to consider mobility from a systemic perspective, where the goal is minimizing travel time, cost and discomfort between two points. Te Brömmelstroet et al. argue this excludes some social dimensions of mobility (te Brömmelstroet et al., 2017). Autonomous mobility is promising dreams of radically individualistic liberation, with vehicular individualism and dreams of frictionless movement as improvement on existing traditional transport infrastructure (McGuirk and McGetrick, 2017). This perspective, originally from California’s Silicon Valley, is linked to the philosophy of cyberlibertarianism—a collection of ideas that links ecstatic enthusiasm for electronically mediated forms of living with radical, right wing libertarian ideas about the proper definition of freedom, social life, economics, and politics in the years to come.’ (Winner, 1997). It specifically considers information technology as tool-for-liberation (from inherited structures of social, political and economic organization), enabling radical individualism, namely self-realization (‘rapture in cyberspace’ (Winner, 1997)). It enables the seeking-out and inclusion of like-minded people in a cyber-community, a social order close to classical communitarian anarchism, with a Jeffersonian vision of citizen and society (Winner, 1997).

Winner argues that technology embodies social relations, including power (Winner, 1980), and that technology is a tool, a mechanism that redefines relations of power between groups and over time. He argues that we are technological somnambulists, sleepwalkers in our relationship with technology by considering technology only as a simple tool that can be downed and picked up again, separate and distinct in its use and manufacture, whilst ignoring its long-term socio-political consequences. Technological somnambulism, Winner argues, results in an unnoticed, quiet restructuration of the seemingly mundane around us, and with that our whole world (Winner, 2004, 1997). To Winner, the Californian fantasies of radical self-transformation and reinvention of society, ‘obfuscate a great many basic changes that underlie the creation of new practices, relations and institutions as digital technology and social life are increasingly woven together’ (Winner, 1997). Furthermore, cyberlibertarianism’s concepts of rights, freedoms, access and ownership mediated by technology favour profit seeking by technology firms (Winner, 1997). Data is a valuable commodity, maximizing efficiency of automation in real time for newly interconnected user markets to provide opportunities to maximise returns on capital (Graham and Marvin, 2001).

To examine whether this development is desirable, we draw from a framework widely used in the study of geographies of power (Cresswell, 2005), namely Scott’s concepts of public domination and hidden resistance (Scott, 1990). According to Scott, dominance and resistance cannot be separated, but instead are inextricably linked in complex entanglements of power. Moreover, Scott writes of the crucial importance of the public and the hidden in power, with the public nature of domination and the private nature of
resistance of the disenfranchised. He has documented practices such as ‘foot-dragging, evasion, false compliance, pilfering, feigned ignorance, slander and sabotage’ in rural (more dispersed and less politically organized) and factory settings, and tax- and conscription evasion among the middle class and elites (Scott, 1985) (p.29).

In the phronetic research context of this study, we consider power relations between the different actors in the emerging system of autonomous mobility in Finland. Actors include technology companies, government agencies, citizen associations and many more in the emerging sociotechnical system. From Winner, we posit that technology may have agency on the physical, social, and ethical dimensions of the urban environment. We define power to be a dialectic between domination through SDV technology agency and hidden resistance of the social context (or ‘infra’) of urban structure. This study considers technology as tool for the car user agent, and potential transformations in urban living around the car user agent. In other words, we consider resistance as a diagnostic of domination.

4. Research design

Our research design centres around the use of narratives in phronetic (planning) research as they are one of the oldest and most potent ways to account for human experience. This analysis draws from 30 thematic research interviews involving 31 respondents (12 female, 19 male, one interview involved two respondents). Using an approach by Kivimaa and Martiskainen (2017), the respondents originate from a network of 23 institutions from the public, private and civil society sectors involved with and touched by the emergence of SDV technology in Finland. In Table 1, the Regional Transport Authority, the Regional Development Agency and the Material and Energy Efficiency Agency are owned by the municipalities in the greater Helsinki region. The two national government agencies represented traffic safety and transport networks and infrastructure. Respondents in the research organizational field came from transport, privacy law, constitutional law and campus management.

Interviews were conducted over the course of late 2016 to early 2017. The majority (26) of the interviews were conducted face-to-face, two interviews were conducted over the phone, one interview over Skype, and one by email. Thirty of the respondents were located in Finland in the Helsinki capital region and one outside Finland. Judgement sampling was used, consisting of a list of key and specialized respondents, supplemented by snowball sampling to add outlying specialized respondents to the original sample. Table 1 shows their organizational positions. The sample size was deemed to be sufficient when no new material or respondents were forthcoming. Some limitations in the sampling occurred—more respondents from special groups and other, non-capital, cities were wished for, but it proved impossible to find willing respondents from these institutions during the empirical research period.

The questions were designed in a semi-structured manner to elicit a broad narrative, spanning from the general to the particular. In this paper we focus on the interviewees’ responses to these questions:

- What are your views/opinions on the future of self-driving (vehicles/mobility) in an urban environment? (general question about SDVs)
- What are, in your opinion, the most important factors from the point of view of your organization on SDV technology as a means of transport? What is the position of your organization on SDV technology as a means of transport?
- Is your organization somehow preparing for self-driving vehicles? In your opinion, what are the key organizations that should take part in decision-making?
- Any other opinions that you would like to add?

All interviews were transcribed and a thematic analysis was performed of the transcripts, allowing themes to emerge from the data. Coding was performed using ATLAS.ti software (versions 7 and 8). To make sense of the data, an emergent coding scheme was used (Lofland et al., 2006). It is through initial content analysis of the transcripts that the theoretical framework, used in this article, emerged as appropriate. The interview transcripts were reread and coded for repetitive themes that could be characterized as dominant transcripts of technological agency and hidden transcripts of context. The next section presents the three key dominant transcripts and four hidden transcripts of resistance in relation to them.

5. Findings

5.1. Dominating technological transcripts of agency

This section examines the dominant technological transcripts of agency about SDVs in Finland that emerged in respondents’
interviews. By dominant transcript of agency, we mean transcripts where technology is conceived narrowly as a tool for the car user agent, where it is described as bringing gains to the user, as such a solution. We find three dominant transcripts of agency based on cyberlibertarian ideology: liberation of the driver, safety of the driver and customer accessibility.

5.1.1. Liberation of the driver
The first transcript of agency is that of autonomous mobility technology as tool-for liberation—bringing algorithmically-mediated liberation from the driving task, congestion, obstacles to speed (such as finding or waiting for public transport), relationships to other road users and parking. Liberation from congestion and increased speed are described by one respondent as resulting from a change from efficiency of transport along corridors (prioritizing speed) to efficiency via algorithmic routing. Algorithmic routing is argued to increase speed and flexibility, enable MaaS, flexible pick-ups and drop-offs, and a host of other services tied to human practices. According to one respondent, even infrastructure becomes flexible to service the user, with ‘flexible infrastructure’ replacing ‘big investment in a system of stops’ to avoid ‘a too big an investment in a system of stops that cannot be changed afterwards’, users as ‘co-creators and co-designers’ of the line [Senior Official, University 1]. In this view, algorithmic routing effectively reconfigures transport infrastructure (Graham and Marvin, 2001), as articulated by this respondent:

[S]tructures are made so that everything is based on corridors [...]. [W]e have a chance of really changing the scene to something much better, whereas now the transportation space kind of both defines and takes up a lot of the space. So that is why it carries a lot of impact [...]. [T]he stations that should be sort of the hubs are not even close to being able to take on this kind of a change, they are not pliable to any other system to be honest. Other than parking spaces. And even that, they are not good at. [Founder, Finnish Smart Mobility Start-Up 1]

Moreover, a respondent from a Finnish Government Ministry contrasted flexibility and dynamicity with a public transport seen as less optimally efficient and costlier. The technology is portrayed as an enabler of MaaS through carpooling — by renting one’s private SDV to the pool or for picking up ride-sharers. The public good of over capacity is trumped by efficiency. This liberation transcript reaffirms automobility and the continuation of a libertarian, individualistic lifestyle—liberation from making more sustainable choices to justify travel in areas that necessitate commuting, such as commuter belts outside Helsinki that have little or insufficient public transport provision.

5.1.2. Safety of the driver
Liberation’s bedfellow, safety of the driver is a dominant technological transcript of agency put forward by several respondents from Finnish governmental organizations, particularly at national level. As 80 to 95% of traffic accidents are caused by human factors (a figure that was quoted by several respondents), they argue that removing the human from driving decisions, and replacing the driving process with algorithms, removes the (human) cause of accidents. In this case, SDV technology is a tool for the car user agent, to help prevent traffic injuries generally, but also in handling difficult driving conditions, such as those resulting from ice and snow.
In the words of these government agency specialists:

Where there is no driver, there is significant potential to improve traffic safety. [Senior Advisor, Automated Transport, Government Agency 1]

So we hope to see whether we can do it [remove the 90% fatalities] on snow and icy roads. [Principal Advisor, Government Agency 2]

SDV technology is perceived as a tool for safety gains not just to the car user agent but also for other users outside the vehicle. In this case, data is seen as the answer to all problems. The data is increased, but the danger is not removed.

And to be sure [that there won’t be accidents], we need data, to make sure how the vehicle is moving. How people will behave: do they feel safe? How will they feel its safetyness, how will they feel to travel and to walk besides, and walking, biking, using car or public transport besides system? [Principal Official, Transportation Planning, Local Government Authority]

There is evidence to suggest that the bigger picture is political, as this respondent indicated:

Transport safety is a massive political strength. The pros that come from it, […] that will be just politically gold, really, […] I would also put the cost reduction, […] they will also have politically […] major strengths. It can also have weaknesses if we do not deal with the employment issues smartly, but, […] it is kind of this whole, […] “the robots are going to take away our jobs” and stuff, it is extremely black and white discussion, which I don’t think that it will be. [Official, Finnish Government Ministry]

The safety of the driver transcript implies safety as a function of big data trumps sharing urban space with more vulnerable users and could promote a culture of vehicular individualism where these vehicles, including private vehicles, are to be preferred to other forms of transport as safer.

5.1.3. Customer accessibility

Customer accessibility is the third dominant transcript of agency. In this transcript, there is a shift from provider-oriented public transport service provision to a discourse of customer-oriented, individualistic use of transportation services, typically technologically-mediated by means of digital apps. The question, according to this Finnish technology entrepreneur is:

Transportation services will be the future, […], if we go towards on-demand services, the question will be how are those trips ordered, how are those trips paid for, and how the user data is handled. [Founder, Finnish Smart Mobility Start Up 1]

Self-driving vehicle technology will enable many people to do things they could not earlier, for example children or elderly or people who cannot drive themselves and so on, so it will be a tremendous boon in many ways. [Candidate, Political Party]

When they started rolling out with Kutsuplus8, at that point it was still kind of cool, trendy to have something new, […] to have this seamless integrated payment in the app, […] even going back a few months it was still like something completely groundbreaking, now it is like you’ve gotta have it, but […] it does not bring any cool factor. What is happening in the payments sector, or in FinTech9, I think that in a couple of years’ time that is just going to explode and have massive effects in the transport sector as well. [Representative, Finnish Government Ministry]

The premise of this accessibility transcript is the high penetration of internet use by Finns, as evidenced by figures on internet use. In 2016, 88% of the population aged 16 to 89 used the Internet, and 65% of Finns did so with a mobile phone, including 81% for online banking and 74% for reading newspapers and news sites (Official Statistics of Finland (OSF), 2016). However, whilst almost everybody aged 55 or under used the web, only 74% of those aged 65–74 and 31% of those aged 75–89 were web users (Official Statistics of Finland (OSF), 2016). This suggests that other modes of transportation that do not require internet booking may be more accessible in the short term. However, one respondent indicated that the low speed of SDV shuttles may be well-suited for assisting elder mobility:

I think it is kind of, if having the elderly people to trust this kind of technology, then they should be a perfect solution to kind of take the place of the service line, named the neighbourhood line, the small buses. I think it would be a perfect solution, especially in those areas where there are shops and you need to get there, elderly people to the shops or to the health centre or the hospital. [Lead Researcher, National Government Research Organization]

5.2. Hidden transcripts of social context

This section examines the hidden transcripts of social context. By hidden transcripts of social context, we refer to narratives dealing with potentially profound transformations in societal relations and urban living around the SDV car user agent, regarding such issues as societal privacy, use of streets and institutional trust. These transcripts are transcripts of resistance that express doubt and criticism towards the dominant cyberlibertarian transcripts presented above. Taken together, the hidden transcripts articulate

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8 ‘Kutsuplus’ (literally ‘InvitationPlus’) was an on-demand bus service trialled in the Helsinki area. It was withdrawn after being considered too costly.

9 Financial Technology. For a definition, see (Schueffel, 2018).
that one of the keystones of technology in urban planning is that it affects people in the plural, at the multiple level, rather than the individual at the personal level. Namely technology perceived as a tool highlights the individual user perspective while neglecting technology as common socio-material infrastructure. In the words of this respondent:

> It is important that it should be part of overall urban development, not a technological issue that you can buy something from a shop like you buy a device [...] and it does not affect other people what kind of device you have. But it has lots of impacts to other people what kind of car you have, or system. [Senior Official, Transportation Systems, Regional Transport Authority]

Four core transcripts were identified that relate to the idea that technology affects people in the plural, and are presented below.

### 5.2.1. Restricting the sharing of street space

The hidden transcript of restricting the sharing of street space is associated with the dominant transcript of liberation of the driver. The respondents consider this transcript as hidden in relation to politics and government policy discourses. It expresses doubts about the ability of the technology to account for the social, with instead the physical and social environment being reshaped by a change in the street necessitated by the technology. The algorithms are a tool for liberating the car user from the driving function, but, to be functional, they need to impose restrictions on non-SDV street users. SDV technology is effectively a black box, extended beyond the vehicle to a constellation of technologies and actors in the sociotechnical system of autonomous mobility. Replacing the driver with the technology brings with it more uncertainties, difficulties, obstacles and concerns about planning for the technology, especially with regards to reliability and in relations with third parties. In the words of this planning authority official:

> [Technology is seen as the answer to all problems]. Space does not matter in politics. [Senior Official, Land Use Planning, Local Government Authority]

In practice,

> In many countries these automated cars vehicles development is more based on government policies than city policies. So the governments are really keen on pushing, “We need these! We want to do these! We made the regulation! The technology is there! Let’s do it!” And I see the same in Finland. [...] if we talk about urban area, it is really crucial that city and city region, the functional region is a driver of that, because it is really part of the land use and the whole infrastructure and part of other services. [Senior Official, Transportation Systems, Regional Transport Authority]

One respondent indicated that while a vehicle supplier may develop a vehicle to a sufficient technical standard, many more actors are involved besides which need be considered, including

> everybody involved in knowing where the vehicle is and where it should be, and what is happening around it, and that could be everything from, basically, the mapping provider and this type of 3D maps from cities or whatever you have, and also information about co-traffic like what else is on the road, how it will be supplied. [Partner, Sustainability Innovation Consultancy].

This raises issues of uncertainty, coordination and technological responsibility especially with suppliers. As this government agency advisor puts it:

> And nowadays, the big problem is, that we do not exactly know what the industry is doing, they are not really telling us what they need [...]. Two or three years ago, I always heard from them saying, “Now we are planning to operate our vehicles on the current roads, so you don’t need to do anything”. And then another guy says, “Well, it would be very nice if when you do some upgradings on your road network, when you repave your road, when you repaint them, it would be very nice if they would be exactly kept in the same place, all the paintings and markings would be on exactly the same place as they were before”. Then I have to ask them, “Do you realize what that would cost us to make it exactly the same?”, so sometimes they are giving us very unrealistic requirements and sometimes they have given us no requirements at all. [Principal Advisor, Government Agency 1]

One concern is that the automation of transport may simply displace the human for safety reasons as it cannot replicate or understand driving as a social situation (especially if the automation is of private cars)—for instance in crossing the road, or handling geographic and cultural differences (the Place de l’Etoile in Paris was given as an example as a place with unique rules, as well as the difference in driving styles between the city and the countryside in Finland). They quote cultural differences in attitudes to safety, and geographic and cultural differences (the Place de l’Etoile in Paris was given as an example as a place with unique rules, as well as the difference in driving styles between the city and the countryside in Finland). This raises issues of uncertainty, coordination and technological responsibility especially with suppliers. As this government agency advisor puts it:

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It is worth noting how the technology redefines the responsibility of the driver. As full automation is still not achieved, the driver still has responsibility for taking back control in emergencies. One respondent fears drivers who cannot do so on time may face being banned from driving automated vehicles, while other cases, the urban environment may be reshaped to minimize disruption to drivers, for instance by excluding pedestrians and cyclists. As some companies are advocating prioritizing the safety of their drivers, the emphasis is on removing any human being that may be in the way. Manufacturers are shaping things by using their power, from politics and technology, to shift the burden of liability onto the urban environment.

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10 One respondent, an expert on constitutional and human rights law, clarified that under the existing legal framework animals benefited from no such protection and could be killed.
5.2.2. Loss of safety of shared space

Another hidden transcript was revealed—loss of safety of shared space, as resistance to the dominant transcript of safety of the driver. Safety emerged as a social function of the presence of others, the position of the person (their status) and feelings of inclusion. Feeling physically safe as a user, including as a woman, disabled person or a child, was found to be directly influenced by factors beyond the technology, such as the urban design, traffic volume, and public transit provision amongst other things. In particular, the presence of drivers and street dwellers performs a social role that increase the feeling of safety in shared space. In the words of this Senior Official from the Regional Transport Authority, ‘If there is a driver, that creates trust’.

The presence or absence of a driver was thought to impact values such as perception of safety not just inside, but outside the vehicle and in the rest of public transport. The possibility of antisocial behaviour, from alcohol consumption to rowdy behaviour, was perceived to be exacerbated because of the removal of the driver, combined with the space being smaller and more intimate. The concept of place had a role, with city centres seen as a more likely place for behaviour termed antisocial than suburbs. The high levels of independent mobility enjoyed by Finnish children (Shaw et al., 2015) may be threatened by the lack of driver. In the words of these respondents:

[I]f everybody in the future is using this then maybe the street safety is less because the social control is not there [...]. When there are a lot of people [...] you can always rely that you are not just yourself and something might happen to you, like some guy jumping from the bushes or something. [A]n alcoholic comes in, it is a small space and there is nobody to take care of it. Also you can use more alcohol. [I]t is different from the tram. It is intimate and small. A different social setting. [Representative, Umbrella Organization of Citizen Neighbourhood Associations]

It is important that children could feel that they are safe when being in traffic and using the vehicles, especially if they use them alone. [S]ometimes it is more safe to use public transportation. [Senior Official, Public Authority for Children’s Rights]

In the competition for the allocation of limited space inside a public vehicle, some groups reported feeling socially unequal, and the removal of the driver may exacerbate this. In the words of this respondent, a user of a (large) electric wheelchair:

Other people are not so considerate particularly because you are competing for the same free space. You compete for space with people with small babies. [Senior Official, Representative Body for Disabled People]

The mention of drunkenness in the urban environment and on public transport by a (female) respondent matters. Finnish drinking culture is a visible public health hazard on public transport. It favours a spirit-induced heavy intoxication, especially at weekends (Österberg and Mäkelä, 2009), facilitated by urbanisation creating more social situations that valorise it. While theoretically Finnish law bans alcohol consumption in public transport (considered public space), and allows it inside taxis (considered private) (Ministry of the Interior, 2010), in practice, alcohol consumption and heavy intoxication are tolerated on public transport, resulting in challenging travel environments for women and other vulnerable groups on weekend nights. Hence one respondent was concerned that the lack of driver negates the accepted safety strategy of standing next to the driver.

In other words, removing the driver (by driverless shuttles) may come at the loss of safety of shared space and equality for some, a consequence of which could be a preference for private transport.

5.2.3. Vulnerability of the passengers

Secondly, as well as feeling safe in the social environment as a result of the presence of well-meaning others, the issue of human control emerged as part of feelings of safety, in both able-bodied and vulnerable users. This is a transcript of vulnerability of the passenger, as transcript of resistance to liberation of the driver involving reliability, trust and responsibility issues for passengers inside the vehicle.

From a customer point of view, reliability can be an issue. If something happens like what to do as there is no driver and in the future too if it is on the road somewhere and you don’t have anyone to talk to. Service phone or something. [Senior Official, Transport Systems Planning, Regional Transport Authority]

You have no control over the thing once you are inside. You are in the box and something happens and there is nothing that you can really do and you have to put yourself at the mercy of the technology, like your body. And if the normal car is a billion times more unsafe, at least you are in control. [Representative, Umbrella Organization of Citizen Neighbourhood Associations]

Feelings of being in control, arising from the presence of a driver took special significance for vulnerable users such those with disabilities. The driver or attendant plays a crucial role in helping in cases of accident or malfunction. According to this respondent, removing the driver marginalizes the person with a disability. Interestingly, the feelings are the same regardless of the speed travelled.

[W]e might have an accident, but I feel comfortable knowing there is still a human between me and the machine. [I]f I am alone in the car and the computer goes haywire, I would be completely helpless. [Senior Official, Representative Body for Disabled People]

The question of trust, and responsibility of the driver, is particularly poignant when thinking about the implications for children and those unable to decide for themselves. As this respondent commented:

11 In this case, respondents referred to driverless shuttles, which can be considered a form of public transport.
You are testing this with mothers I presume? When my sister had a baby, she was so terrified that something happened to her little one, she could not even drive for the first couple of months. The idea of going into a self-driving car with a dependent child is difficult. [Senior Official, Representative Body for Disabled People]

Vulnerability of the passenger is a hidden transcript of context that occurs as resistance to the liberation of the driver. It is a very strong transcript—it can make even disabled people who feel liberated by conventional transport feel marginalized.

5.2.4. Loss of privacy

With data flows including real-time motor data, driving data, speed data (for some models), GPS trackers, cameras, data about the environment amongst others, there are concerns (expressed by one of the respondents) that the system enabled by ubiquitous devices such as mobile phones, may be designed to reveal a lot of social meaning from the aggregated large quantities of data, such as traffic flows. The concern is that this will change fundamental rights alongside opening up monetization of data. The concerns extend to the management of data over time (data does not disappear), who is responsible for managing it, and even who decides what data is to be collected. The solution is to pay careful thought to what data is gathered in the design of the system. In the words of this respondent:

This is personal data. This is a fundamental right. [A]s history and experience show, once this kind of data is there, it is highly likely that this information will be abused for other purposes including law enforcement, surveillance, and other security purposes. This is one of the fallacies that comes with vehicle automation. [P]eople that build this system must understand that you need to design them so that they don’t track people in that way. I think that is going to be a challenge. [Privacy Law Academic, University 1]

There are concerns that this loss of privacy may cause some groups to be excluded, in this case people with disabilities. The sociotechnical system created by autonomous mobility may affect accessibility in social terms. Disability can take many forms, physical and psychological, outwardly visible or invisible. Social, physical and digital infrastructure regulate access (inside and outside of transport mode, user interfaces, and as a sociotechnical system). While physical barriers can be on the way to the public transport, on public transport itself, and in the places it serves, social ones can be built into the system too.

Mobility, described as the ability to move around was deemed very important by disabled people, with a preference for a personal vehicle. The self-driving shuttle was described as for able-bodied that are temporarily disabled, i.e. those that do not suffer exclusion from accessibility:

[P]eople who have temporary restrictions in their mobility or people who are pregnant might find this service useful. [Senior Official, Representative Body for Disabled People]

Disabled people have a right to mobility services enshrined in Finnish law (Terveysministeriö, 1987). Municipalities provide adapted mobility services for work, study and leisure when public transport is not accessible. The number of trips per person is limited by law and applied through a local social worker (The Support Centre for Disabled Immigrants (HILMA) and The Finnish Disability Forum, 2011). Respondents indicated that this is a sore point of contention amongst disabled people, effectively limiting social life. In particular:

It limits my autonomy. If I go to a gay bar in Helsinki, people will know. [E]very trip you take is recorded somewhere. Someone is interested in where did you go, how long did you take, when did you come back. Everything is catalogued somewhere. If I decide that I want to go to the most hard-core, gay place in Helsinki, it is no longer just my business, a whole team of people know about it. [Senior Official, Representative Body for Disabled People]

Let’s just say that if a person with a severe disability wants to stay overnight with someone else, with or without disability […] If you are in the system, like I am now the information of ten people before the morning. If someone calls, they might ask, why did you go to that address? That address is not listed as your home address or work address. Then you are forced to say, well I had a one night stand. The system is built in such a way that it intrudes upon your privacy […] It is a topic of much conversation among disabled people. [Senior Official, Representative Body for Disabled People]

If you use a trip to go to a pub, for example, that is a little bit frowned upon, because you are not supposed to use [travel] funds for frivolous purposes. You should only use funds to go to church. Church on Sunday and a pharmacy on Monday […]. That is really judgmental. [N]ine trips per month, two trips per week. [I]t is a very Calvinist idea […]. [M]any of our associations have reported that they can no longer have so many social activities like clubs or peer groups because people have a limited number of these leisure trips […]. [Senior Official, Representative Body for Disabled People]

There is both concern and genuine curiosity about whether self-driving technology could help alleviate the concerns expressed by these transcripts or reinforce them. While it was introduced last, the hidden transcript of loss of privacy is a particularly strong one, as it is directed critically to all three dominant transcripts of technological agency.

6. Conclusions and discussion

This study aimed, in relation to the emerging SDV technology, to identify possible implications of changing power relations in the...
context of urban living, by mapping dominant transcripts of technological agency and hidden transcripts of context by users that are intermediaries in this transition.

Interviews with 31 intermediaries resulted in material from which three dominant (agency) and four hidden (social context) transcripts were identified, using a theoretical and conceptual approach to power and resistance to it, as embodied in discourses of the actors involved with planning for the technology, including those excluded. Using as starting point the idea that technology ‘has politics’ (Winner, 1980), and that its power may lie in the dialectics between agency and structure, transcripts of agency of the technology were identified and considered dominant by their narrowness of agency focus. Discourses of hidden transcripts of resistance to domination were sought in the narratives of the intermediaries—hidden as they revolved around intangible changes in the urban living conditions, such as values not generally found in technology discourses.

Three dominant transcripts of technology agency generate four hidden transcripts of social context (Fig. 1). Liberation of the driver may come at the cost of restrictions in sharing space and introducing vulnerability of the passenger. Safety of the driver may come at a loss of safety of shared space safety. Finally, customer accessibility may come at a loss of privacy. All three dominant transcripts together with their data demands are resisted by a hidden transcript of loss of privacy. In other words loss of privacy affects different users in different ways, with some users more impacted than others. Therefore technology is not the great leveller cyberlibertarianism claims it to be.

This piece of research faced some limitations. More responses from older people, children, housing associations, amongst others; and how they are affected as customers through the expansion of the Large Technical System to include banks and insurance, would have enriched the research. Perhaps this richness and a more detailed outcome would have been achieved with a grounded approach. The discourses identified from the interviewees’ speech tended to be compartmentalized—i.e. planners talk about space—and some having broader coverage than others. Moreover, while the transcripts were selected to be revealing in terms of power relations, they are neither exhaustive nor finite. In the phronetic research tradition, they should be considered as a basis for further enquiry as part of a process of continuous knowledge making.

This research approach also had its strengths. The analysis of the discourses of power was grounded on a phronetic research approach, revealing knowledge that a systemic modelling approach does not. In this case, however, this occurs potentially through the implementation of a technology system, namely self-driving vehicles.

There are practical policy implications of transcript identification. The transcript identification allows us to look beyond SDV technology as tool for liberation from urbanity. As urbanity is after all about sharing place, it allows us to consider from a phronetic perspective the practice of transport planning and the question of social relations, to design for liberty in mobility on the one hand and urbanity on the other. Namely, from a mobility perspective, there are similarities in the findings of this article with findings on how mobility choices shape social relations (te Brömmelstroet et al., 2017). Mobility, he argues, should bring connectedness with place and the other (society), and by focusing on systematic aspects of mobility, how it impacts quality of social relations is under researched (te Brömmelstroet et al., 2017).

This research underscores the need for a phronetic research approach to technology transitions in the urban context, rather than taking refuge in the technology (Fesmire, 2016; Kremer and Dorstewitz, 1952; Tschaeppe, 2016). According to Winner (Winner, 1993), our social choices about technology have cultural, intellectual and economic origins—with the social activities of technology making determined by class. The relevance of social actors engaged in defining technical problems is controlled by political bureaucrats, and technological choices can be skewed to favour some social interests and exclude others (Winner, 1993). The Finnish information economy, while generating a wealthy smart economy, could create poor urban environments or segregated societies (for instance excluding people with disabilities). A pattern appears to emerge of technology and power in Finland, with respondents representing technology, capital and knowledge elites, including universities, innovation and government organizations, capitalists, reporting cyberlibertarian perspectives on the technology that match Finnish innovation policy. At least one respondent reported that the latter are often the only intermediaries invited to the development table, without civil society representatives in equal measure. That these technological elites shape SDV futures through Finnish innovation policy may have implications to Finnish

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**Fig. 1. Dominant transcripts of agency and hidden transcripts of social context.**

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<thead>
<tr>
<th>Dominant transcripts of agency</th>
<th>Hidden transcripts of social context</th>
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<tr>
<td>Liberation of the driver</td>
<td>Restrictions in sharing space</td>
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<tr>
<td>Safety of the driver</td>
<td>Vulnerability of the passenger</td>
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<tr>
<td>Customer accessibility</td>
<td>Loss of safety of shared space</td>
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<td></td>
<td>Loss of privacy</td>
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society—potentially reshaping social space, social life and social contract in myriad ways.

The reason may be the much more siloed nature of the Finnish central government in relation to the local government. Road planning and construction have thrived in a splintered administrative environment, applying 50-year old predict and provide, speed and time saving as a goal and as societal efficiency methods, with poor understanding of contemporary urban realities (Lampinen, 2015). With such an approach, SDVs may appear as relatively unproblematic to the state transport agency and ministry of transport.

The Finnish planning institution may need to show societal reflectivity in the face of the dynamics of technological change in the urban environment. While Finland has a legalist institutional tradition—where great trust is invested in law, administration and administrative institutions, including the planning system, in Finland (Puustinen et al., 2017), autonomous technology may force insidious changes to those institutions and to society.

These are issues that require further research. We hope that our study has revealed the importance of the phronetic and socio-technical research approach to the scientific community researching SDV technology and autonomous mobility transitions in urban and social contexts. Further research should be conducted continuing in this overall thematic, focusing on the policy and planning responses on the potentially undesirable transformations that SDV technology may bring to urban living conditions—so that these could be reflected on in advance.

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Appendix A. Supplementary material

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