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The Effective and Ethical Development of Artificial Intelligence: An Opportunity to Improve Our Wellbeing

Transport and Mobility

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The current debate on artificial intelligence and its applications in mobility and transport are far-reaching and complex. In the context of mobility and transport and intelligent transport systems (ITS) many of the scientific discussions materialize on automated vehicles (aV) and automated driving in general. Both, the side of the technical artefact (vehicle) and the side of mobility practice are considered to be significantly changing. As (Canzler & Knie, 2016) put it digitalization and the implementation of AI systems into transport will change mobility markets, business models, infrastructure development and the social practices of travel and communication. The question is: how exactly and in which depth the new systems will interfere and transform societies' ways of interacting, meeting and transporting people and goods.

As a sort of ideal typological structuration of the debate we can say in the field of mobility and transport two main story lines can be identified: the 'optimist' and the 'skeptical' narrative. In many ways these discussions lack from a strong evidence base (Dangschat, 2017). So far only very specific and singular examples can be used to the future of automated driving and AI in transport must be imagined on a wider scale.

The two story lines can be characterized as follows:

- a) The 'optimist narrative' has been promoted strongly by engineers, IT companies and suppliers, consultants, administration and politics – specifically in urban agglomerations. Very often a 'technocentric planning paradigm' (Miciukiewicz & Vigar, 2012) has been predominant which in its most positive connotations is promising solutions for nearly all contemporary transport problems (Dangschat, 2017). These promises are ranging from the decrease of accidents to almost zero, a comprehensively efficient traffic control, significant reductions of energy and a decrease in emissions, the increase in inter-modality, significantly higher accessibility rates for mobility impaired people and increasing social participation and most important (at least as a selling point for vehicles): more comfort, relaxed traveling and shorter travel times.
- b) The 'skeptical narrative' has been strongly promoted by critical journalists, social scientists and transdisciplinary science and technology analysts (Hajer & Dassen, 2014; Greenfield, 2017; Rifkin, 2015; Dennis & Urry, 2009; Maurer, Lenz, Winner, & Gerdes, 2016). This position strongly challenges the assumption that the application of AI in transport leads to any significant reductions in transport volumes. In contrast leading experts in the field even expect increases in automotive practice due to the new accessibilities for young people, older people, mobility impaired and those users who dislike driving a car (Dudenhöffer, 2016;

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Diez, 2018; Meyer & Shaheen, 2017). Other skeptical or critical arguments are that the increased availability and accessibility of automated vehicles (in particular when shared services will be elaborated) will lead to a rebound effect, also through easier access to premium vehicles. Some skeptics also see a strong social conflict potential and increasing social inequalities coming along with AI and aVs as it is likely that in the first place the purchase of aVs will be very expensive due to small numbers and the high costs for technologies. It is also predicted that insurances will possibly react with higher rates for driver-owners of cars due to the higher risks of accidents in a changed automated environment.

In the following we will refer to the questions raised for this statement:

1. What are the likely intersecting transformations between physical, communicative, digital and virtual mobilities in Australia in the next 5 to 10 years?

In the first place we expect a stronger intermingling and almost melting together of physical, communicative, digital and virtual mobilities. Within the past 20 years mobility practice and behavior have changed significantly. The ongoing miniaturization of mobile devices (Castells, 2009); (Elliott & Urry, 2010) has changed travel behavior in many ways and new business models and digitally based opportunities shape the mobility cultures in cities worldwide (Canzler & Knie, 2016; Willis & Aurigi, 2018; Freudendal-Pedersen & Kesselring, 2018a). While being on the move in the urban centers people are present and interacting through and within many different spaces: geographical, urban, topological spaces, social spaces and digital/virtual spaces. All at the same time the boundaries between physical, social and virtual realities become more and more fluid and interconnected. (Licoppe, 2018) shows how gaming and interacting while being on the move in urban space is connected and generates new patterns of social interaction and travel.

In the case level 4 and 5 autonomous vehicles will be commissioned for use in daily traffic and it will work out to optimize the reliability of the systems autonomous driving (AD) will enforce the blurring of boundaries between stationary and mobile social activities. What has begun in public transport, the boxing of activity spaces and spaces for recreation and between public and private spaces, will continue on a new level. Nevertheless, much will depend from public acceptance of new technologies and the trust people will put into these highly complex expert systems (Fraedrich & Lenz, 2016).

But at the same time virtual technologies will also play a bigger role and specifically in large and scarcely populated countries such as Australia and New Zealand, where infrastructure is still a problem. Today, companies experiment increasingly with remote forms of collaboration and even holographic conference and meeting tools to avoid travels (Denstadli, Gripsrud, Hjorthol, & Julsrud, 2013).

There are also the big telecommunications companies who aim for selling and creating technology for increasing bandwidth. They want to put new technology on the mobile phone towers and we can expect them to be the drivers of technological developments and opening up new opportunities for usage while people are driving in automated vehicles and no longer driving it. People who are generating content for social media are targeting those potential customers and users who are, today, still stuck behind their steering wheels: *'oh ok, you are going to be spending two hours in your car still, but you don't have to drive...then we can tell you a thing about our products'* (Interview with an Australian planning expert in Melbourne).

Living in the suburbs of an Australian city means the car is an essential technology enabling people to work, participate, visit friends and relatives and so forth. Not having the option of using public transport, cycling or walking extensively in the middle of the outer suburbs structures travel and

interaction patterns. Right now the discussion goes to offering people faster trips, but on the other hand even if you are stuck in traffic, you won't have to be concentrated on driving, you can do something else. So it is almost as if these things are being developed – quasi path-dependently - to allow people to further live their lives dependent on private vehicles and within poly-centred and sprawled cities.

2. What penetration of autonomous vehicles will we see in next decade?

Many car-manufacturers have claimed 2025 as the year by which there will be widespread take-up of autonomous vehicles (Diez, 2018; IHS Automotive, 2014). Researchers of the Insurance Australia Group (IAG) defined self-driving vehicles as 'assisted', 'mainly driverless' and 'driverless'. They have forecasted the penetration of mainly driverless cars within Australia's vehicle fleet (currently 18 million) to reach just 20 percent by 2035. IAG expects mainly driverless vehicles to account for 48 % of cars on the roads, and for fully driverless vehicles to comprise 14 % by 2040 (see <https://www.motoring.com.au/driverless-vehicles-decades-away-says-iag-112044/>).

In the following we are taking into account that Australia doesn't have a car manufacturing industry anymore and the last big factories held by General Motors and Toyota are just closing down. The last 20 years they have been part of the international car manufacturing market, but for the big international companies it's cheaper to make cars elsewhere and the Australian market is small compared to other markets. Thus is the reason why it is more effective for multinationals to produce the cars elsewhere. That means Australia and New Zealand will be depending on producers and suppliers from other part of the world such as the US, Japan, Europe and maybe increasingly also from China. Those countries have R&D in the field of autonomous vehicles and the big manufacturing sectors that are providing parts for the automotive market and autonomous vehicles.

What is mostly left out in these discussions on future developments are the cultural aspects of the ongoing transition. So far, the unique selling point for cars, in particular in the premium segment where most R&D is made, comes from the driver-owner concept and the experience of driving. As clearly seen by authors such as Burkart (1994), Sachs (1992) and Urry (2004) automobility is a culturally embedded societal concepts. Even if we are witnessing significant changes it is still routed in a Fordist concept of societies as it has been inscribed into the Athens Charta (1933) and Le Corbusier's powerful ideas of the functional city. The car has become an iconic artefact symbolizing individuality and success – and maybe even more: control (Manderscheid, 2018). And meant is not only control over the machine but rather about the individualized life course of modern 'mobile subjects' (Kesselring, 2008).

3. What secondary effects (e.g. on real estate, the gig economy) can we expect in next decade?

In fact, it is very hard to anticipate the secondary effects on real estate and the economy. Mobile work is still massively increasing forecasts estimate up to 25 percent potentially mobile jobs in the near future (Kesselring, 2015); (Gareis, Lilischkis, & Mentrup, 2006; Pearn Kandola, 2007). In many different sectors work on the move has been a reality for decades. With a stronger presence of AVs in urban, peri-urban and interurban transport and traffic new working cultures will emerge. In many ways the future is already here and quite on a daily basis (Laurier, 2005; Hislop, 2016). In sale, repair services, health care and so forth AVs will have a strong impact on working routines, cultures of collaboration, and mainly on the fact that increasingly tasks can be made on the way home instead of piling up for the time when the worker will be back to his home or office.

This also means that office space can be negotiated and structured in new ways. As seen from teleworking social cohesion within companies and teams often needs face-to-face and co-presence.

Only 2 percent of the German working population are working completely in their home offices while being connected to the company. Mostly people working in so called alternate telework which means they are commuting to the office at least once a week to keep social contact and maintain social relations and networks.

Nevertheless we can expect significant effects on real estate. Already today, in respect to new concepts of sharing mobility (see (Freudental-Pedersen & Kesselring, 2018b; Dowling, Maalsen, & Kent, 2018) which include autonomous carsharing, current forms of carsharing, bike, ride and scooter sharing etc., investors think about new architectural concepts of how to use space and how to avoid big investments in parking lots and garages.

Tyfield (2018) has pointed out that the investment push coming from new mobility concepts and services can be expected to be massive and lasting. What we can see is the rise of new markets for services, products, and labor. Australia which is very much part of the U.S. economic orbit will be sort of porting the crossbar. It is still open how much car-based mobility will be shared and how big the specific national potential of customers will be. But taking into account the heated discussions we can observe in the German car industry and between politics, OEMs and suppliers the development it is hard to imagine that this wouldn't lead into a deep-going transformation of the automotive industry and the whole mobility sector.

4. What regulation is needed to enable and ensure technology benefits Australia?

First of all, it is important not to consider autonomous driving and vehicles being the answer for modern mobility problems. Rather they can be one element in a complex environment of different mobilities. The historically unique success of the car - and not its failures - lead to the transformative and creative self-destruction of the 'system of automobility' (Urry 2004) where we do not yet see the full picture. This means the driver-owner concept of the car, where owning and driving a non-autonomous vehicle will loose its current normative power and the automotive sector its economic key position of today. The 'generation Y' shows significantly different travel patterns to other generations before and the normative meaning of the car is changing. While the driver's license symbolized adulthood so far, it has been replaced by other things such as specific computers, expensive smartphones etc.

Automobility is in an irrevesible transformative process, because societies and their normative complexes are changing. Today, it seems modern societies are moving from the 'system of automobility' to new diversified 'systems of multi-mobilities'.

In respect to regulation this means:

- It has to be avoided that the future of mobility will be designed based on a technocentric approach. Not regulation is the necessity in the first place. Rather it is a broad process of governance following the idea of 'technology in society' instead of 'for society'. Stakeholders need to develop common ideas, concepts and in the end rules of regulation which will be governed by the state. Ideally it is possible to apply a governance models such as 'technological citizenship' (Zimmerman, 1995) where cross-sectoral collaboration leads to society-based concepts of how to connect new technologies with mobility practice on the level of everyday travel, commute, business travel and logistics. Recent studies such as (Rode, Hoffmann, Kandt, Smith, & Graff, 2015) show the diversity of possible mobility patterns and the integration of new mobility services into everyday life. There are also examples of discursive processes which demonstrate the existing methodological 'toolboxes' of how to organize technology development and assessment based on dialogues instead of top-down implementation strategies.

- This also come together with an assessment of the public sector and public policies. In many countries it has been strongly influenced by neoliberalism and thinking that authorities mainly have to facilitate business. Approaches such as Hajer's 'smart urbanism' show that bottom-up processes of the are more successful and more sustainable (Hajer & Dassen, 2014; Banister, 2008; Miciukiewicz & Vigar, 2012).
Instead of merely responding to what the private sector demands for, policies and regulation should be driven from what desirable mobility future shall be. Instead of constructing technologically possible infrastructures for the implementation it is the main task to organize processes which aim for understanding what is the socially desirable future of livable cities and regions and their mobility systems (Urry, 2011; Urry, 2016).
In a nutshell: It is a question about whether the role of the public sector is to facilitate these technological directions or whether it is to try to shape them. Planners and policy makers are very conflicted about these questions. At the moment it seems in many European but also Australasian countries that technology and capability sits within the private sector.
- As a practical dimension of regulation it is to be considered what exactly is the status of AVs within a complex and highly dynamic system of multi-mobilities. Autonomous driving should be part of measures which support public transport as a backbone system but doesn't compete with it or take space and resources away from it. Then autonomous driving can support the transition towards sustainable mobilities.

References

- Banister, D. (2008). The sustainable mobility paradigm. *Transport Policy*, (15), 73–80.
- Burkart, G. (1994). Individuelle Mobilität und soziale Integration. Zur Soziologie des Automobilismus. *Soziale Welt*, 2, 216–241.
- Canzler, W., & Knie, A. (2016). Mobility in the age of digital modernity: Why the private car is losing its significance, intermodal transport is winning and why digitalisation is the key. *Applied Mobilities*, 1(1), 56–67. <https://doi.org/10.1080/23800127.2016.1147781>
- Castells, M. (2009). *Mobile communication and society: A global perspective ; a project of the Annenberg Research Network on International Communication* (1. paperback ed.). *The information revolution & global politics*. Cambridge, Mass., London: MIT Press.
- Dangschat, J. (2017). Automatisierter Verkehr – was kommt da auf uns zu? *Zeitschrift Für Politikwissenschaft*, 27(4), 493–507.
- Dennis, K., & Urry, J. (2009). *After the car*. Cambridge: Polity.
- Denstadli, J. M., Gripsrud, M., Hjorthol, R., & Julsrud, T. E. (2013). Videoconferencing and business air travel: Do new technologies produce new interaction patterns? *Transportation Research Part C: Emerging Technologies*, 29, 1–13. <https://doi.org/10.1016/j.trc.2012.12.009>
- Diez, W. (2018). *Wohin steuert die deutsche Automobilindustrie?* (2., überarbeitete und aktualisierte Auflage). Berlin, Boston: De Gruyter Oldenbourg.
- Dowling, R., Maalsen, S., & Kent, J. L. (2018). Sharing as sociomaterial practice: Car sharing and the material reconstitution of automobility. *Geoforum*, 88, 10–16. <https://doi.org/10.1016/j.geoforum.2017.11.004>
- Dudenhöffer, F. (2016). *Wer kriegt die Kurve? Zeitenwende in der Autoindustrie*. Frankfurt, New York: Campus Verlag.
- Elliott, A., & Urry, J. (2010). *Mobile lives: Self, excess and nature*. *International library of sociology*. New York NY /// London: Routledge.

- Fraedrich, E., & Lenz, B. (2016). Societal and individual acceptance of autonomous driving. In M. Maurer, B. Lenz, H. Winner, & J. C. Gerdes (Eds.), *Autonomous Driving: Technical, Legal and Social Aspects* (pp. 621–640). s.l.: Springer.
- Freudendal-Pedersen, M., & Kesselring, S. (2018a). Networked urban mobilities. In M. Freudendal-Pedersen & S. Kesselring (Eds.), *Networked urban mobilities series: volume 1. Exploring networked urban mobilities: Theories, concepts, ideas* (1st ed., pp. 1–18). New York, NY: Routledge.
- Freudendal-Pedersen, M., & Kesselring, S. (2018b). Sharing mobilities. Some propaedeutic considerations. *Applied Mobilities*, 3(1), 1–7. <https://doi.org/10.1080/23800127.2018.1438235>
- Gareis, K., Lilischkis, S., & Mentrup, A. (2006). Mapping the Mobile eWorkforce in Europe. In SALTSA (Ed.), *Mobile virtual work: A new paradigm?* (pp. 45–70). Berlin, New York: Springer.
- Greenfield, A. (2017). *Radical technologies: The design of everyday life*. London, New York: Verso.
- Hajer, M. A., & Dassen, T. (2014). *Smart about cities: Visualising the challenge for 21st century urbanism*. Rotterdam: Nai010 Publ. Retrieved from <http://www.nai010.com/en/component/zoo/item/smart-about-cities>
- Hislop, D. (2016). The diverse patterns of work-related business travel: Accounting for spatial scale. *Applied Mobilities*, 1(2), 219–233. <https://doi.org/10.1080/23800127.2016.1245091>
- IHS Automotive. (2014). Emerging technologies: autonomous cars— not if, but when. Retrieved from https://supplierinsight.ihsmarket.com/_assets/sampleddownloads/auto-tech-report-emerging-tech-autonomous-car-2013-sample_1404310053.pdf
- Kesselring, S. (2008). The mobile risk society. In W. Canzler, V. Kaufmann, & S. Kesselring (Eds.), *Tracing mobilities: Towards a cosmopolitan perspective* (pp. 77–102). Aldershot, Burlington: Ashgate.
- Kesselring, S. (2015). Corporate Mobilities Regimes. Mobility, Power and the Socio-geographical Structurations of Mobile Work. *Mobilities*, 10(4), 571–591. <https://doi.org/10.1080/17450101.2014.887249>
- Laurier, E. (2005). Doing office work on the motorway. In M. Featherstone, N. J. Thrift, & J. Urry (Eds.), *Automobilities* (pp. 262–277). London, Thousand Oaks Calif.: Sage.
- Licoppe, C. (2018). Mobile 'pseudonymous strangers': How chance encounters constitute sociality in digitally augmented and location-aware urban public places. In M. Freudendal-Pedersen & S. Kesselring (Eds.), *Networked urban mobilities series: volume 1. Exploring networked urban mobilities: Theories, concepts, ideas* (1st ed., pp. 36–49). New York, NY: Routledge.
- Manderscheid, K. (2018). Performing or deconstructing the mobile subject? Linking mobility concepts, reserach designs, and methods. In M. Freudendal-Pedersen & S. Kesselring (Eds.), *Networked urban mobilities series: volume 1. Exploring networked urban mobilities: Theories, concepts, ideas* (1st ed., pp. 124–139). New York, NY: Routledge.
- Maurer, M., Lenz, B., Winner, H., & Gerdes, J. C. (Eds.). (2016). *Autonomous Driving: Technical, Legal and Social Aspects*. s.l.: Springer.
- Meyer, G., & Shaheen, S. (Eds.). (2017). *Disrupting Mobility: Impacts of Sharing Economy and Innovative Transportation on Cities* (1st ed. 2017). *Lecture Notes in Mobility*. Cham: Springer International Publishing.
- Miciukiewicz, K., & Vigar, G. (2012). Mobility and Social Cohesion in the Splintered City: Challenging Technocentric Transport Research and Policy-making Practices. *Urban Studies*, 49(9), 1941–1957. <https://doi.org/10.1177/0042098012444886>
- Pearn Kandola. (2007). *A Study: Understanding and Managing the Mobile Workforce*. Retrieved from http://newsroom.cisco.com/dlls/2007/eKits/MobileWorkforce_071807.pdf
- Rifkin, J. (2015). *The zero marginal cost society: The internet of things, the collaborative commons, and the eclipse of capitalism* (First St. Martin's Griffin edition // First palgrave Macmillan Trade paperback edition). New York, NY: St. Martin's Griffin; Palgrave Macmillan.

- Rode, P., Hoffmann, C., Kandt, J., Smith, D., & Graff, A. (2015). *Toward New Urban Mobility: The case of London and Berlin*. London.
- Sachs, W. (1992). *For love of the automobile: Looking back into the history of our desires*. Berkeley: University of California Press.
- Tyfield, D. (2018). *Liberalism 2.0 and the rise of China: Global crisis, innovation and urban mobility. Routledge advances in sociology: Vol. 228*. London: Routledge.
- Urry, J. (2004). The 'System' of Automobility. *Theory, Culture & Society*, 21(4-5), 25–39.
- Urry, J. (2011). Does Mobility Have a Future. In M. Grieco & J. Urry (Eds.), *Transport and society. Mobilities: New perspectives on transport and society / edited by Margaret Grieco and John Urry* (pp. 3–20). Farnham, Surrey, Burlington, VT: Ashgate.
- Urry, J. (2016). *What is the Future?* (1. Aufl.). Cambridge UK, Malden, MA: Polity. Retrieved from <http://gbv.eblib.com/patron/FullRecord.aspx?p=4678286>
- Willis, K. S., & Aurigi, A. (2018). *Digital and smart cities. Routledge critical introductions to urbanism and the city*. New York: Routledge.
- Zimmerman, A. D. (1995). Toward a More Democratic Ethic of Technological Governance. *Science, Technology, & Human Values*, 20(1), 86–107. <https://doi.org/10.1177/016224399502000105>