# Digitalisation Case Study Author: Daniel Bwanika 2021 April

Title: Automated Vehicles and the evolution of transport systems Abstract

Digitisation of social life is extending to urban infrastructures. Transport system and network are becoming the next causality of digitisation. However, key issues are becoming more evident such as public safety, data regulation, energy sources and the requisite infrastructure that enables automated vehicles possible in-built environments. The article attempts to understand the convergence of different variables as society attempts a transition from fossil led transport system to overtly electic automated urban transport networks.

Introduction

Digitisation is percolating all society levels and economic sectors at far more heightened speed than what people on individual, communities and organisational levels have anticipated. From the banking, transport, urbanisation, agriculture and more other sectors, digitisation is rapidly disrupting the social norms of everyday lifestyles. The implications are not very clear, as well as the intention and goals to be attained with digitisation. Some research has reduced digitisation simply to auditing and accountability (Giuseppe et al., 2020), economic inspired developments (Morgan and Webb, 2020), entrepreneurial or generally shrinkage of managed societies or simply displacement of stage-managed spatial planning problem (Douay, 2018)

Research behind these developments and innovations in digitisation, is so generalised just mentioning the probable scenarios I will come to shortly.

Transport Automation has stakeholders that can be categorised as follows:

1. Technical (the Academia and Innovators)
2. Infrastructure (Government and Policy Makers)
3. Social (the Users)

For automated transport to happen, urban design and traffic management (engineering) concerns involving all above three group’s must be met. Users’ needs are different from government, governance, innovators, and policy (political) guidelines as it is to what might be scientifically possible. In addition to consideration of when, where and who: plans, designs, finances, implements, manages, regulates (see Dobbin, 1994) do raise the concerns and difficulties that might result from implementing automated transport system in a functioning complex urban environment built on different transport infrastructure logics. This paper focuses on the social where concerns are being raised.

The geographical context of this work is mainly the city and how transport automation will affect known city life. Whereas requisite infrastructure remains a lesser key issue in transport automation debates, the focus is confined on transport automation in general and the advantages and disadvantages generated thereof. That can be misleading, on assumption that transport automation builds on what transportation and its configuration is today – transport automation requires its own ontology. The main reference article for this

article is Impact of Driverless Vehicles on Urban Environment and Future Mobility by Serio Agriestib, Fausto Brevia, Paolo Gandinia, Giovanna Marchionnia, Rahul Parmarc, and Luca Studera based on 47th European Transport Conference 2019, ETC 2019, 9-11 October 2019, Dublin, Ireland.

Literature Background

The choice of the paper above is ideal in that it offers some glimpse into specific areas of transport automation limitations and possibilities, outlining requisite infrastructure and technical necessity to ally society fears but also pointing to opportunities that are emerging in transport automation. This is specifically different from other general papers that have operationised and problematised transport automation embedded with other sectoral issues of digitisation defining transport evolution solely, because of transport digital platforms. There is still very low experience of urban automated transport system in the built environment. That there are few places i.e., in Brisbane Australia (see guardian article) that is piloting partial automation where urban transport automation has been fully implemented. Hence there is lack of regulatory, policy and technical details to lay ground for an empirical framework, in a thorough scientific analysis. These scenarios are due to the fact that there is no clear real-time empirical data rather than experimental details of how automation will affect urban society. It is important to understand the existing urban infrastructure as a derivative of the 1700 industrial urban infrastructure. That is exactly where the lacuna is, since the fuzziness implies a non deductive or inductive explanation of transport automation albeit it’s potential to erase all that is known and bring in the unknown. Urban mosaic today has elements that have to be redesigned to make automation possible. That has not been done so far. Largely digitisation is responding gradually to factors of production or market signals. Industrial urban centers still have zoned industrial as opposed to residential areas.

Questions are budding in the economic, security, technical and social spheres and answers can’t be reduced to the known transport infrastructure alone. The questions therefore becoming mere scenarios. It could be assumed that by examining the scenarios: safety, surveillance, privatisation, public service, urban sprawl and connectivity, mobility and congestion, parking and municipal economies could be answered.

The scenarios given above are model framework to explain key concepts and how these can be collaborated with other variables in understanding automation from experimentation to implementation.

Methodology, empirical material & case study overview

The methodology for this paper, analyses transport experimentation from literature review. That is the most basic evidence nearest to urban automated transport there is, that can be used as of now to understand the trajectory of transport automation in face of lack of regulatory, policy and technical frameworks. Questions are arising if transport automation will be partial, fully connected or automation will enlarge transportation service provisions hence inducing its own infrastructure demand.

Transport automation is not largely new. There are automated trams and light trains however in isolated urban spaces operated on dedicated lines. Automated transport system in existing urban infrastructure results in questions that might be difficult to answer, since there is nowhere full transportation automation takes place though automated trams and

light trains with dedicated lines are operational. Moreover, city forms are currently not organised for automated transport system and networks. The question arises therefore if automated vehicles in densified areas like cities, is the same transportation model possible in the current built environment. How then will the questions be raised that will answer concerns of effected communities?

Current transport issues can be categorised into two specific areas based on existing infrastructure-social reasons:

1. Motorised transport system: That have created a number of issues highlighted in the case study namely:
	1. Congestion
	2. Pollution
	3. Green houses effects
	4. Health care (i.e., accidents and injuries from collision and accidents)
2. Transport needs and advantages that have been mentioned:
	1. Economic growth (motor vehicle industry)
	2. Movement of goods and services
	3. Access to rural areas
	4. Leisure
	5. Education (student transport)
	6. Social (augmenting human connectivity) etc.,

There is a lot known about the above variables. The scenarios therefore rotate around these issues and the questions that arise are whether we can use existing transport models to understand automated transport systems and models without understanding the requisite urban configurations.

Discussion of problems and possibilities

Societal discussion or debates derived from the above transport structure is whether automated vehicles can indeed resolve current urban problems brought about by motorised transport systems. The concern is whether transport automation is a solution, to clear fossil fuel pollution and if it eliminates fossil-based fuel vehicles. And that is besides the key concern of sustainability and urban flows. Automated vehicles so far, largely use batteries made from minerals: cabolt and rare earth minerals that are new mineral exploration. The question that is arising though, is whether electrical automated vehicles will actually solve existing problems since the existing technologies, is based on batteries of which polluting capacities and potential is not clearly understood.

It appears, with emerging platform society (Lee et al., 2020), one would be able to have a vehicle on demand but that too, is still very speculative since it is not very clear if connected vehicles will eliminate congestion where regimented traffic public bus system where it exists, faces the same problem particularly at peak hours. So far, there is increased use of platform transport services in the food and courier distribution industry using electric bicycles (partial automation). That does automatically reduce vehicle densities and indeed pollution from travel frequencies. However, it will be very difficult to conclude, how automated transport development when it comes to the distribution of goods and services and transporting passenger attributed to the old transport system will resolve congestion, parking, energy consumption, and safety issues.

Industrial cities have been key in generating their own economic and technological logics. Car parking is one area that has been generating a good portion of finances for municipalities and cities. It is assumed that this will not be the case with automated vehicles that do not in “principle” need parking lots since the vehicle can be accessed on demand. Here there are emerging issues that urban spaces are geographically expanding, whilst urban economies are being constrained. Will cities allow the economic loss besides, not knowing if the automated vehicle will need parking space or not?

Since the automated transport system has not really been enforced in real life scenarios it is not clear how it will improve urban dwellers health which is one of the major urban concerns i.e., reduction in injuries, pollution, and collision. Experimental data claims that automated vehicles do actually, increase safety. On the one hand there are projections (Giuseppe et al., 2020 pg.48) made in several cities using existing transportation system models. Will the same model apply on automated transport system? However, on the one hand automated vehicles are creating new industries that will of course create new jobs and industries hence new economic possibilities.

Consequences derived from emerging infrastructure

The results are derived from the discussions about the case study and Giuseppe et al., (2020). There are also practical experiences that can be used in situating the results from this discussion – electric scoots and bikes. With above arguments and developments in the transport industry with electric vehicle, and societies reaching a critical mass with climate effects, health issues are facing seemingly limits know from current transport infrastructure. Some countries cities have banned electric scoots and bikes. Besides, and with increasing motor vehicle population, cities and municipalities can’t expand roads and streets infrastructure endlessly. It is costly and expensive. The same applies to the growth of vehicle population can’t exponentially keep on increasing and that will indeed grow rapidly, with cheap electric vehicles. It is economically, and environmentally not sustainable to have large vehicle population. More and more countries have realised this fact, and that to continue with industrial economic progress, human ingenuity will direct the course of automation transport destiny but that is an instrumentalist view that makes automation of transport infrastructure and system more than a possibility of the unbearable urban system and network.

Let us examine a number of issues that would work in a real-time scenario.

1. With critical study of existing infrastructure there can be partial (modular) implementation of the automated vehicles to serve given social groups and sectors: Education, Health Care centres, Goods and Services distribution system.
2. Strategic spatial planning is setting new trends in urban planning. With new urban forms and possibilities of automated transport system the possibility of prototyping automated transport system based urban form becomes possible. That implies retrofitting the current city building, road, street network and embedded utilities.
3. The cost and consequence of using fossil fuels has exceeded the environmental social benefits hence it is globally appreciated that new fuel system have to be innovated.
4. New urban forms bedevilled with industrial organisation issues is forcing change. The possibilities however slim are coming with automated transport infrastructure; it is increasingly becoming acceptable that digitisation will be taken to another level once transport industry moves from hybrid to fully electric vehicles.

There is a time for adaptation of the new social-technical systems. From literature there a network of innovators are pushing forward these technologies in an induced demand. The entrepreneurial networks make a bulk of emerging techno-socioeconomic system that appeal by *appearance* to the communities, technical and policy makers but with less fundamental solutions to *indispensable* urban transport planning problems. But the question remains whether the appealing technology will resolve and entrench the associated urban problems.

Vertical integration (Lee et al,. 2020 pg. 122) highlights given patterns but also how it takes place in real life. Solving existing transport appended problems will of course cause the requisite infrastructure that enables automated transport system in urban areas. The question is the cost as seen from railway development in Dobbin, (1994) where different actors have fundamental differences as per their role in society. Here we can see real-time solutions where there is an amalgamation of virtual and physical infrastructure albeit based on the identified problems and convergence of different actors’ desires and roles in regard to urban transport planning.

# 6. Conclusions

Stakeholders, the academia, the policy makers, users, workers, businesses, entrepreneurs, and innovators will need more information that what is currently out there, about transport automation is beneficial. To eliminate speculative discussion, these issues have to be more illuminated more than what has been done so far, that is currently how economic loss in municipalities and cities will be met with emergency of automated vehicle use, crucial to allow political expedience. There is need for technical illustration of how some of the vagueness with safety and surveillance issues can be resolved. Developments of legislation to protect users are urgently needed.

The level of proliferation of automated infrastructure in day-to-day lifestyles can guide adaptation and scaling up. Moreover, there is need for new skills and industries that are emerging – this will cover job losses that need to be clearly defined. Therefore, new skills and education needs are enormous, but have to be understood in form of possibilities, for society to be able to adjust accordingly. The very fact that rural areas are shrinking, mainly due to distance , unemployment and transport bottlenecks, low-cost automated transport networks might come in handy to bridge that gap between the rural and urban areas. Critical analysis of the problems can be key to resolving this major automated transport development issues. Digitisation of transport infrastructure have to identify major sustainability issues not only as how virtual infrastructure with their limited software and hardware life span, but also focusing on major environmental issues as explained by climate scientists. There is also a need to bridge the gap, who makes decisions in automation of transport infrastructure for example moving transport automation from private to public services and vis versa, particularly in areas where usability can be optimal. Above there is an illustration of contemporary needs for transport infrastructure.

Through human ingenuity, there appears to be a top-down implementation of automated transports systems and networks. This is because of safety concerns but also infrastructure needs (land use) that can be designed by governments. The industry is expanding hence new incomes coming with new economies. From both the academic and policy makers world there are needs to converge the uncertainties, environmental issues, and possibilities. The

arguments brought forward are largely based on the existing transport infrastructure experiences and inadequacies.

There is need to understand key determinants in automated transport system for safety, travel time and accessibility. It appears safety issues from automated vehicles will be different from the existing safety issues with old transport infrastructure. The same determinants should answer issues of equality, power, benefits, and health care challenges. But more critical to planners will be the challenges of understanding land use disputes and controversies the automated vehicles might generate that are being brought forward with automation of transport networks. This will be in addition to unifying experiences from different users across population clusters: the students, the elderly, workers, social, cultural and gender groups. The challenges to automated vehicles have also to be factored in with other modes of transport. Cycling, scooters and walking that have gained with climate science studies.

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