DAVeMoS

Newsletter

University of Natural Resources and Life Sciences, Vienna
Department of Landscape, Spatial and Infrastructure Sciences
Institute for Transport Studies – DAVeMoS research group

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DAVeMoS is an Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (*Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie*, BMK)'s Endowed Research Group with a mission to strengthen the competitiveness and knowledge building in the field of digitalisation and automation in the transport and mobility system at local, regional, national, and EU levels.

Read more about DAVeMoS at:
www.davemos.online

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Hosted by BOKU Institute for Transport Studies:
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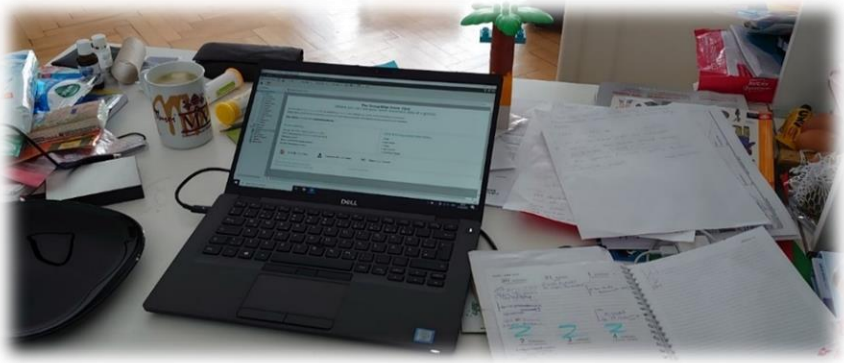

1. The roles of digital alternatives during COVID-19 lockdown

In the last few months, regular daily activity and worldwide economy have been disrupted by the lockdown to reduce the spread of COVID-19 virus pandemic. To cope with such disruption, digital solutions have become an alternative for many people to fulfil their obligatory (such as working, studying) and non-obligatory (such as leisure, culture and sports) needs. The ability of people to adopt and adapt to the digital alternatives, however, is different across socio-economic and socio-demographic groups as well as across types of occupations and branches. For some occupations, the changes from physical to virtual alternative(s) are almost straight forward, whilst for others, they are impossible, stressful, and they significantly deprive people's livelihood and well-being, in particular in the disadvantaged groups.

A study based on an on-line survey shows that the opportunities and constraints guide the change of the behaviour. External restrictions (e.g. limitation of freedom of movements and closure of working places) and personal characteristics (e.g. the presence of elderly) are the driving factors of the reduction in ones' daily trips. Having elderly (older than 65 years old) in the household, for example, on average, ones would have 2.5 of grocery and non-grocery trips/person less, compared to their counterparts. The results do not show any strong indication of the countries' influence (and their unique restriction policy) on one's likelihood to adopt the new behaviours after the lockdown is lifted. The acceptance and long-term adoption of using technology alternatives tie more to the personality and socio-demographic characteristics of the given person, which highlights the importance of promoting alternatives as a part of longer-term behavioural and lifestyle changes.

The findings of the study can be accessed in: http://ssrn.com/abstract=3698595

Yusak Susilo

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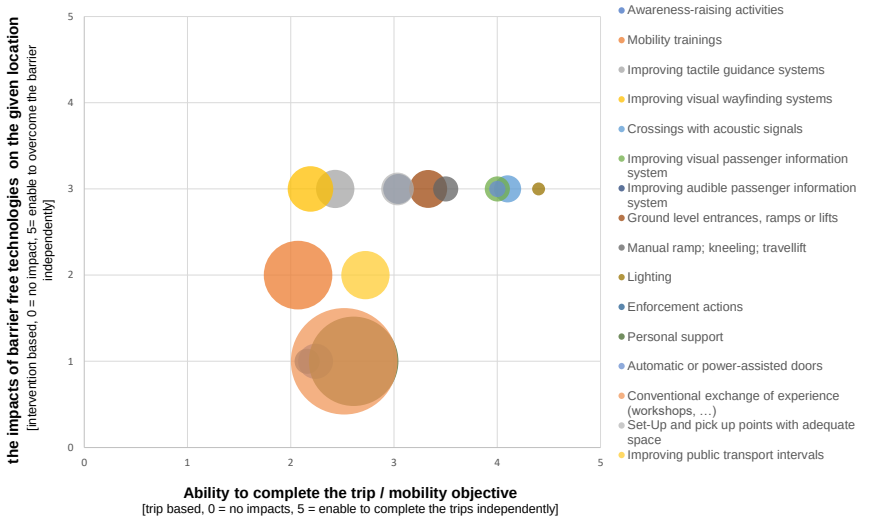
2. How combination of solutions can improve the mobility of people with disabilities

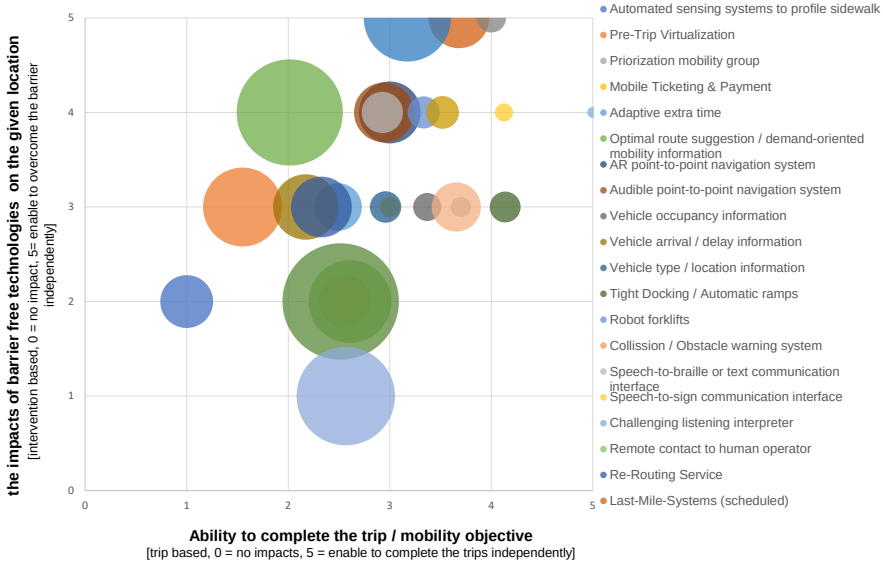
Automated vehicles and digitalised solutions are expected to improve mobility for those unable or unwilling to drive and to enhance independent and spontaneous travel capabilities for travellers with disabilities. Despite the promise of the technologies, it is not yet clear how these different solutions can be used together with the more conventional solutions to improve the capability of these groups of travellers to travel independently in our transport system.

Using a mixed quantitative and qualitative Egalite project data from 452 disabled travellers, we listed barriers faced by people with reduced mobility (physical movement, hearing, vision, mental, voice and speech, and need of guided assistance), and re-coded the qualitative assessments of possible interventions in order to identify the plausible impacts of such conventional and technological approaches to improve the mobility of these groups of travellers. The preliminary results of such exercise can be seen at the two figures at the right hand side.

With conventional measurements:



plausible impacts with additional digitalisation and automation measurements:



Similar impacts are also mapped across different transport modes. It is important to remember that the plausible impacts are based on own assessments and have not been validated with empirical evidence. Nevertheless, this explorative exercise helps us to understand the plausible impact of the technologies on improving the accessibility and mobility of people with reduced mobility.

Michael Skok, Oliver Roider, Yusak Susilo

3. Harmonisation of tests with automated shuttles

From the beginning of 2020, DAVeMoS participates in the initiative to harmonise tests with automated shuttles, which emerged from the biannual networking meetings of all Austrian projects testing such minibuses, jointly organised by the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) and AustriaTech as the national contact point for automated mobility. The team of the endowed professorship supports the development of a knowledge base to advance the standardisation of these tests and thus increase their efficiency. Our contributions include, for example, a summary of international test development or a Swedish case study. We describe the ongoing discussion about critical safety levels or global standardisation efforts. We also examine factors that are relevant for measuring user acceptance.

Vera Baltzarek

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4. Gaining Experience: Update on the real life deployment of Digibus

As member of the BMK's lighthouse project Digibus®, the Institute for Transport Studies is responsible for the development of methods for the integration of an automated bus into the mobility system. For that reason, a System Dynamics Model was established to simulate effects of the new supply and to identify the appropriate operation area of an automated bus.

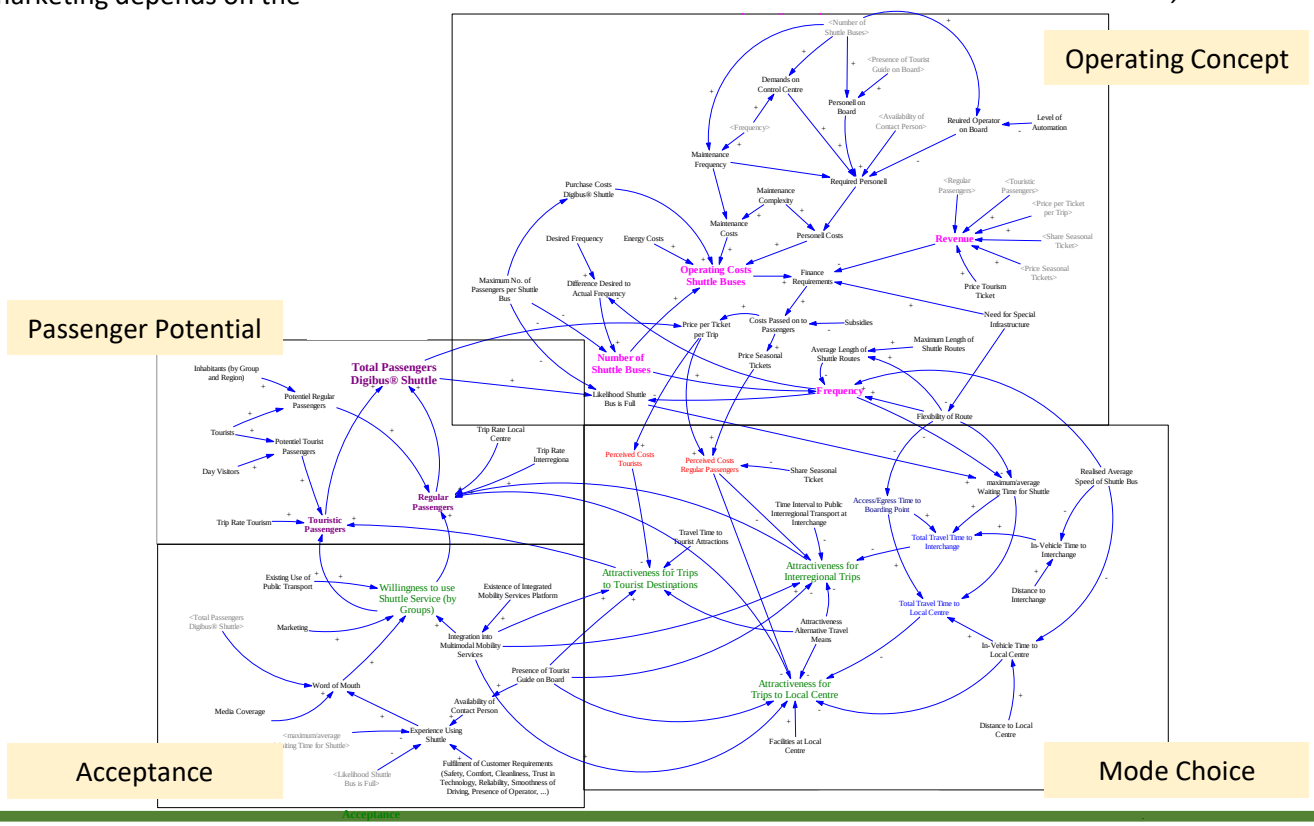
The model approach consists of four sub-models ("passenger demand", "acceptance", "mode choice" and "supply"). Acceptance and mode choice determine the passenger demand, which in turn influences the operational concept (see below Figure). Basis of the model for determining the passenger demand is the number of residents in the catchment area of the automated bus, trip rates and average trips per mode. Based on the coefficients of current Austrian transport model (Käfer et al., 2009) a logit model has been established to calculate mode choice. Alternatives are the use of a private car, the combination of automated bus (as shuttle service) and national bus and a bicycle.

An innovation diffusion model (IDM) according to Bass (Massiani J. & Gohs A., 2015) is combined with a simplified technology acceptance model (TAM) (Davis, 1989) in order to calculate the acceptance of the new service. The percentage of users gained through marketing depends on the duration and effectiveness of the marketing campaign as well as the effect of word-of-mouth advertising. Due to the negative experiences with the automated bus service, active users may also retire, depending on availability and reliability of the service.

Once the System Dynamic Model was established, sensitivity tests were done in order to analyse and validate the model approach and its dynamic behaviour. These tests showed that for the calibration of the model, weighting the utility for the users and the knowledge of the algorithm for calculating mode choice are particularly important. Data of the cost model are to be verified in further developments of the model in order to be able to use more realistic values.

In the next step, the basic model will be calibrated using the data from the real life demonstration of the Digibus. Until October 2020, the Digibus runs in the municipality of Koppl in the Province of Salzburg from the centre of the village over a distance of around 2 km to the stop of the national bus on the B158 to the City of Salzburg. Passenger surveys and focus groups are carried out and the actual behavior of passengers is observed in order to obtain data for a realistic calibration of the System Dynamic Model.

Astrid Gühnemann, Oliver Roider



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5. Q&As with DAVeMoS senior staff

As DAVeMoS is a newly built team, to get to know our staff better, in this newsletter we dedicated our space to have a series Q&As with our new staff.

Roman Klementschitz, Ing. DI Dr.

1) Which are your personal references with regard to Digitalisation and Automatisation in Transport and Mobility System?
I approached this research area from the perspective of its potential contribution towards a sustainable transport system. My first projects were analysing the potential of automatisation in vehicle sharing and demand responsive micro public transport systems (in rural and peripheral areas). Similar in the area of digitalisation, were we analysed the effect on awareness and behaviour change, because of the information provided to the users.

2) What is your specific interest in this area?
My main interests are: How to design a sustainable transport system supported by digitalisation and automatisation, where the needs of the users can be satisfied at a very high level? This means, the attractiveness of sustainable transport modes should be increased by smart techniques. Nevertheless, it is important to study at the same time, how to design (both physically and legally) the transport system in a way, so that all these elements being put together create a consistent picture.

3) What will be the most significant disruption/evolution/revolution in this area on the midterm, you are expecting?
I expect an increasing shift of tasks and partly responsibilities in the transport system away from the end users. More and more, transport systems itself will take over tasks such as driver assistance systems, touchless and intermodal ticketing and payment systems, logistics and delivery etc. Moving around (both people and goods) will be much more comfortable in that way. Therefore, we need to keep an eye on the sustainable development goals and need to develop the systems in the right way.

4) If money or technical barriers do not count: which would be the most comfortable/smartest service making use of Digitalisation and Automatisation in Transport and Mobility System in your point of view?
To be able to buy a train ticket from Vienna to Napoli would be a great step forward already ;-) This would include (at least a Europe wide) mobility information and ticketing platform, where all players deliver their data and accept the booking rules. Ideally, all modes and providers are included in such a system. Avoiding a market dominating oligopoly system like in the area of web search engines or hotel booking platforms, ideally such a service should be hosted by a neutral and non-profit oriented entity.

Martyna Bogacz, MA (Hons), MSc.

1) Which are your personal references with regard to Digitalisation and Automatisation in Transport and Mobility System?
During my PhD, I have been using virtual reality together with biometric sensors in the experimental settings to investigate their applicability in a dynamic bicycle research context. My work so far could be described as an attempt to digitalise traditional, text-based choice experiments within the transport domain by the employment of augmented technologies and inclusion of multiple, novel data sources. Beyond, I have previous experience in the analysis and modelling of multidimensional, large dataset similar to big data formats.

(to be continued)

5. Q&As with DAVeMoS senior staff *(to continue ….)*

2) What is your specific interest in this area?
I am interested in the behavioural and social aspects of digitalisation and automation to understand the relationship between them and human factors since this is a two-way mechanism where the development of new technologies influences the society but equally, the response from the community has an impact on the evolution of the innovative solutions.

3) What will be the most significant disruption/evolution/revolution in this area on the mid term, you are expecting?
Currently, we observe an accelerating digitalisation of different means of transport each within its domain, with lacking connection between them that would promote combined, multimodal travelling. I believe that in the mid-term horizon, the digital 'infrastructure' will be in place to allow for a more holistic approach to travelling, where these different modes will be interlinked rather than operating as separate entities.

4) If money or technical barriers do not count: which would be the most comfortable/smartest service making use of Digitalisation and Automatisation in Transport and Mobility System in your point of view?
If current constraints are addressed, it could be interesting to see a materialised concept of a smart city that allows for the development of an interconnected network of machines to achieve a sustainable and seamless transport solution resulting in reduced pollution and traffic congestion while connecting remote parts of the city to increase social equity of transportation network.

Oliver Roider, Dipl.-Ing. Dr.

1) Which are your personal references with regard to Digitalisation and Automation in Transport and Mobility System?
My first project dealing with digitalisation in transportation was about 10 years ago. Based on mode and route choice data, which were tracked automatically by a smartphone app, and stated preference data we established a model as basis for mode and route choice recommendations for commuters. Currently, I'm part of the Digibus team at BOKU, where we are working on framework conditions for the integration of an automated bus in the transport system.

2) What is your specific interest in this area?
My specific interests are twofold: On the one hand, I'm interested in the potential of digitalisation and automation to improve the accessibility of the transport system for particular groups of the society. On the other hand, digitalisation can support the database for establishing more accurate transport models by collecting behaviour data on a broader basis. This leads to the research question how to integrate new supplies in transport models as basis for appropriate infrastructure investments.

3) What will be the most significant disruption/evolution/revolution in this area on the midterm, you are expecting?
More mobility behaviour data will be collected automatically and will be available for scientific analysis and research. Moreover, digitalisation will further improve the information system tailored to all transport users enabling a cross-modal information and payment system. Automation in transport will be permanently developed in the medium term, however, mainly focused on private car traffic or goods transport driven by manufacture industries e.g. automated driving on highways at SAE level 5. Thus, governments will have to establish framework conditions focusing on the benefit of the whole transport system and society.

4) If money or technical barriers do not count: which would be the most comfortable/smartest service making use of Digitalisation and Automation in Transport and Mobility System in your point of view?
Equal accessibility to the transport system for all parts of our society.

6. Featured Masters theses:

Master Thesis 1: Carl May, 2020, Evaluation of environmental effects of Corporate Mobility as a Service (CMaaS), a DAVeMoS co-supervised thesis in KTH Stockholm/TU Munich.

This thesis quantifies the tank to wheel (TTW) greenhouse gas (GHG) emissions of a MaaS implementation and simulates effects of potential variations in the service. The pilot under focus is an alteration of MaaS, which is exclusively available to the work force of a specific corporation. This variation is called Corporate Mobility as a Service (CMaaS). The evaluation is based on cross-sectional survey among the employees and operational data from the CMaaS operator. The transport demand model applies a person category approach.
The total daily GHG emitted by the work force's on-site mobility is estimated to 3.735 tCO2. Compared to on-site trips by private cars, trips with CMaaS emit less than half as many GHG emissions per passenger kilometer traveled. This highlights the environmental benefits of MaaS, especially in replacing short trips by private car.
Due to the composition of the underlying data sources and therefore chosen methodology the reactivity to implemented scenarios is very limited. Thus, analysis and interpretation of the results is restricted to largely aggregated levels. Nonetheless, this study offers an initial orientation point for further estimation of TTW GHG emissions by MaaS schemes. Beyond, it highlights the lack in understanding and modelling of corporate mobility in general.
The thesis is available to access via: http://kth.diva-portal.org/smash/get/diva2:1448890/FULLTEXT01.pdf

Master Thesis 2: Vera Baltzarek, 2019, Automated Driving in the City - Assessment of possible impacts of the introduction of automated vehicles on the city and urban planning. Contributions to an ecologically and socially acceptable transport planning 1/2019, Vienna

Automated vehicles have been widely touted in recent years as a panacea for all urban transport problems caused by conventional cars. The book checks whether this assumption is correct. It offers a comprehensive summary of the topic (as of spring 2019) based on the relevant scientific and so-called "grey" literature. It analyses the reasons for the - currently somewhat waning - hype surrounding automated driving and discusses the state of research. Uncertainty still prevails among experts, as there is a lack of sufficient empirical data on the probably complex systemic effects of automated vehicles. In Austria, for example, automated cars without driver intervention may only be used on sections of motorways. For test purposes, some minibuses with special permits are also present on public roads. Policy makers and urban planners are therefore advised to continue to rely on the classic instruments of spatial planning to solve urban transport problems, such as the promotion of public transport, cycling and walking, decarbonisation of transport or a dense, functionally mixed city of short distances. Automated vehicles could also contribute to ensuring the quality of urban life, but only if they are used as micro-public transport with alternative propulsion. For urban planners, this implies that they should take a more proactive and coordinating role than in the past.

(in September 2020, Ms. Baltzarek received the Peter-Faller-Nachwuchsförderpreis of the Austrian Transport Science Society for outstanding scientific theses for the thesis described above. The thesis was carried out at the Institute of Transportation of the Vienna University of Technology.)

7. A visit by the Lower Austrian State Minister for Transportation

On July 8th, 2020, DAVeMoS was honoured with the visit of the Lower Austrian State Minister for Transportation, Mr. Ludwig Schleritzko, accompanied by subject specialist Ms. Stefanie Hobiger. Within an approximate one hour visit, a series of discussions on behaviours, automation, digitalisation, cycling and general planning issues, for Lower Austria context, took place during the meeting.

8. List of DAVeMoS activities (04/20-09/20)

In Management:

1. On 1 September 2020, Ms. Martyna Bogacz joined DAVeMoS team. She is finishing her doctoral study from the Institute of Transport Studies in Leeds, UK. Her interest is the behavioral aspect of digitalization and automation with a particular focus on the human decision-making process. Therefore, in her work she intends to use virtual reality, biometric measures and neuroimaging to understand the interaction between digital transformation of transport system and human factors
2. On 17 September 2020, the 1st research board meeting and the 2nd coordination board meeting were held simultaneously. The meetings were held simultaneously with an intention to introduce the members of two boards to each other and foster collaboration between DAVeMoS stakeholders and other research groups within BOKU. Due to COVID-19 restriction, the meeting was held in a mixed format of on-line and in persons. It was attended by 18 people, from the Ministry and different institutes, incl. AustriaTech, Centre for Mobility Change/Innsbruck, KfV (Kuratorium für Verkehrssicherheit), our funders' representatives, and also representatives from research institutes in BOKU.
3. On 29 September 2020, the 1st funder board meeting was held online and was attended by 11 people.
4. DAVeMoS continues to have regular meetings with different funders and relevant stakeholders in Austria.

On the Research:

1. Within the first year, DAVeMoS members have been actively participating in various conference and to date have published 11 conference papers, 1 book chapter, and 9 journal Web-of-Science publications.
2. DAVeMoS has continued to contribute to various initiatives' and innovation efforts, including the preparation of the forthcoming BMK Österreich Unterwegs 2022/2023 survey.
3. In the last six months, DAVeMoS has been invited to give a couple of keynote lectures, including at the first webinar on "Travel Behavior and Smart Cities" of a newly established Israeli National Smart Transportation Research Center on 22 Sept. 2020.

In Education:

1. Since March 2020, DAVeMoS has started contributing in giving courses in the transport planning program at BOKU.
2. Currently DAVeMoS team has been supervising four master theses on topics promoted/requested by our funders and stakeholders.

9. List of DAVeMoS publications (4/20 – 9/20)

Peer-reviewed journal:

1. Vaddadi, B., Zhao, X., Susilo, Y., Pernestål, A. (2020) Measuring System-Level Impacts of Corporate Mobility as a Service (CMaaS) Based on Empirical Evidence. Sustainability, 12(17), 7051.
2. Guo, J., Susilo, Y.O., Antoniou, C. and Pernestål, A. (2020) Influence of Individual Perceptions on the Decision to Adopt Automated Bus Services. Sustainability, 2020, 12(16), 6484.
3. Chee, E.P.N, Susilo, Y.O., and Wong, Y.D. (2020) Determinants of Intention to Use First-/Last-mile Shared Autonomous Bus Service. Transportation Research part A, 139, pp. 350 – 375.
4. Dharmowijoyo, D.B.E., Susilo, Y.O., and Syabri, I. (2020) Time-use and spatial influence on transport-related social exclusion, and mental and social health. Travel Behaviour and Society, 21, pp. 24-36.
5. Liu, C., Susilo, Y.O. and Ahmad Termida, N. (2020) Weather perception and its impact on out-of-home leisure activity participation decisions, Transportmetrica B: Transport Dynamics, 8:1, pp. 219-236.
6. Chee, E.P.N, Susilo, Y.O., Pernestål-Brenden, A. and Wong, Y.D. (2020) Which factors affect willingness-to-pay for automated vehicle services? Evidence from public road deployment in Stockholm, Sweden. European Transport Research Review, 12, 20.
7. Rubensson, I., Cats, O. and Susilo, Y.O. (2020) Is Flat Fare Fair? Equity Impact of Fare Scheme Change. Transport Policy, 91, pp. 48-58.
8. Alhassan, I.B., Matthews, B., Toner, J., Susilo, Y. (2020) The Movingo integrated ticket: seamless connections across the Mälardalen region of Sweden. Transportation Planning and Technology, 43, pp. 404-423.

Conference Presentations:

1. Vaddadi, B., Susilo, Y., Pernestål, A., and Kramers, A (2020) Measuring System-level Impacts of Co-Working on Transport Systems. European Transport Conference, Milan and on-line, September 2020.
2. Zhao, X., Susilo, Y.O. and Pernestål, A. (2020) The long term acceptance pattern of automated public transport service: Evidence from Stockholm. The 3rd Symposium on Management of Future Motorway and Urban Traffic Systems (on-line), Luxembourg, July 2020.
3. Palmberg, R.C.O., Susilo, Y.O., Gidófalvi, G., Naqavi, F. (2020) Towards a better understanding of the health impacts of one's movement in space and time. Mobile Tartu (on-line), June 2020.
4. Stojanovski, T. and Susilo, Y. (2020) Flexible Parking - a Model for Calculating Parking Norms Based on Urban Form and Accessibility Factors. The 11th annual Symposium on Simulation for Architecture and Urban Design (SimAUD), Vienna (on-line), May 2020.