Fitting the Puzzle Together – Challenges and Opportunities for MaaS

International Transport Forum Discussion Papers, No. 2021/08, OECD Publishing, Paris.
https://www.itf-oecd.org/integrating-public-transport-mobility-service-maas-roundtable

(See references and last slides for tips on further reading, and feel free to contact me.)

Jana Sochor, Ph.D., Senior Researcher
Chalmers University of Technology
Gothenburg, Sweden
jana.l.sochor@gmail.com; jana.sochor@chalmers.se

What is MaaS?

MaaS topology (Sochor et al., 2018)

Integration of societal goals
Governance & PP-cooperation

Integration of service offer
Bundling/subscription

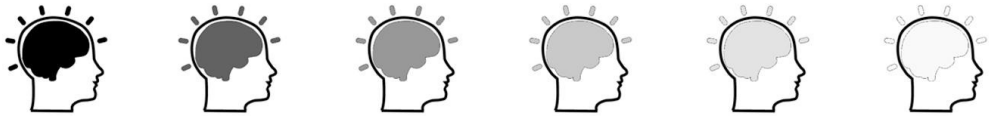
Integration of payment
Single trip - find, book and pay

Integration of information
Multimodal travel planner, price info

No integration
Single, separate services

Reference: Sochor, J., et al. (2018)

MaaS taxonomy (Lyons et al. 2019)

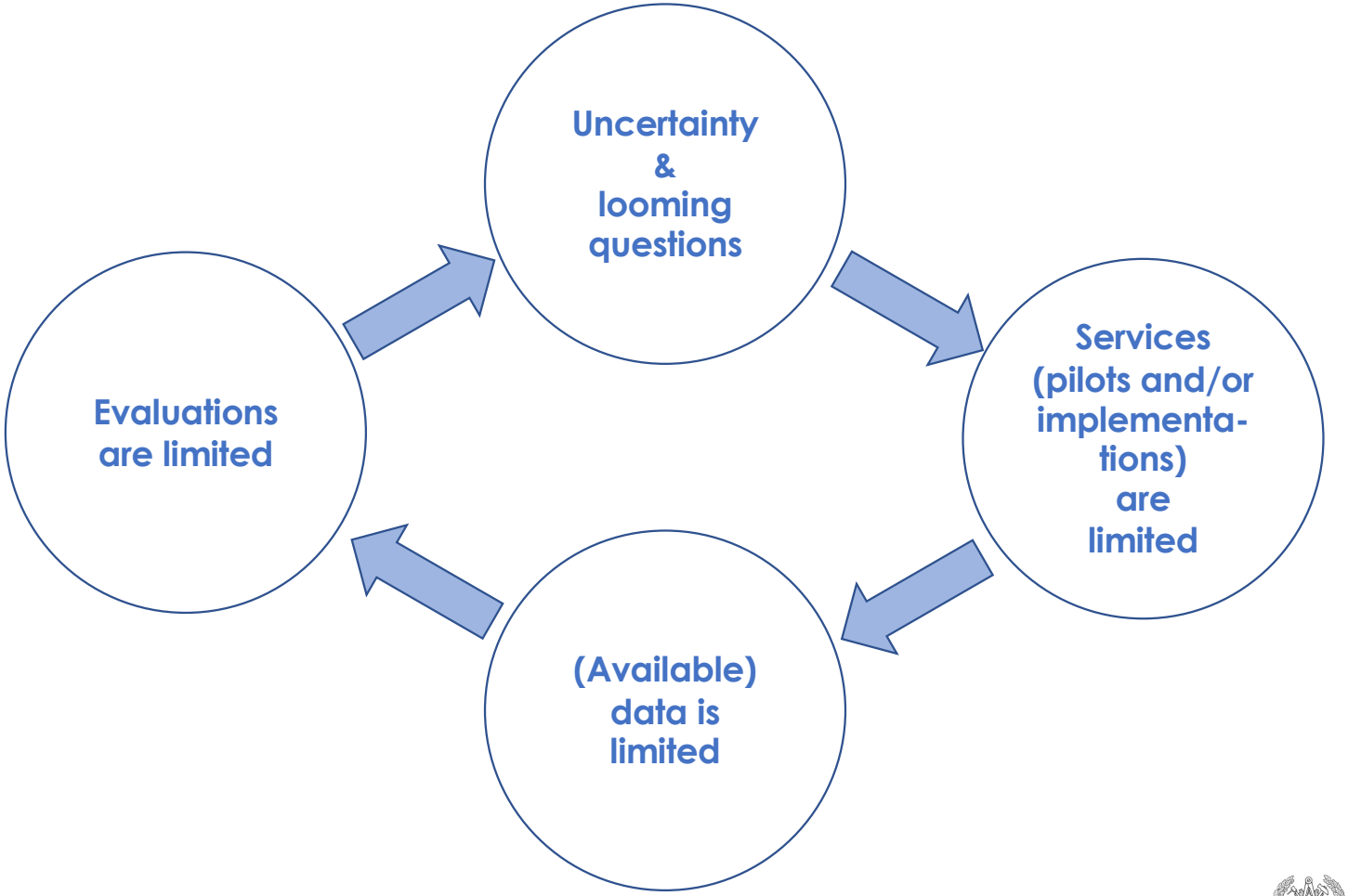


Higher cognitive user effort			Lower cognitive user effort		
Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
No integration: no operational, informational or transactional integration across modes	**Basic integration:** Informational integration across (some) modes	**Limited integration:** informational integration across (some) modes with some operational integration and/or transactional integration	**Partial integration:** some journeys offer a fully integrated experience	**full integration under certain conditions:** some but not all available modal combinations offer a fully integrated experience	**full integration under all conditions:** full operational, informational and transactional integration across modes for all journeys

Reference: Lyons et al. (2019) (open access)

”This was a lot harder than we expected”

Why? In part, uncertainty leads to more uncertainty

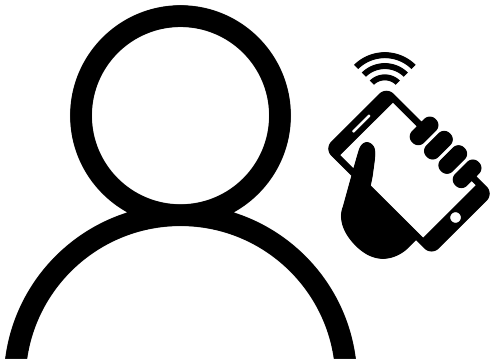


The technology is a tool, not a goal

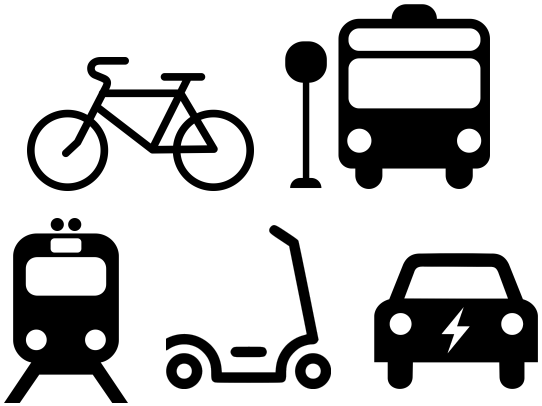
Mobility is more than modes of transport, and seamless / integrated mobility services entail more than a technical interface overlaying those modes.

An eager, but naïve, technology-driven approach – "if you build it, they will come"

Customer segment?



Modes? Bundle?

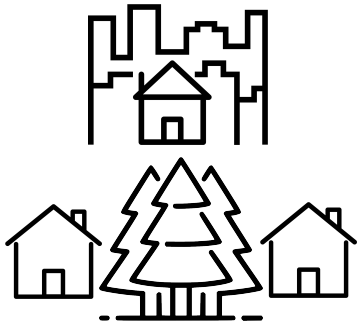


The technology is a tool, not a goal

Mobility is more than modes of transport, and seamless / integrated mobility services entail more than a technical interface overlaying those modes.

A more systematic approach – the "user" in a societal context

Geographic context

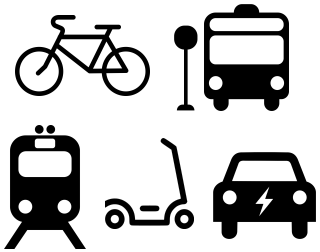


Infrastructure &
mode access
Costs of living
Weather
…

Family / household context

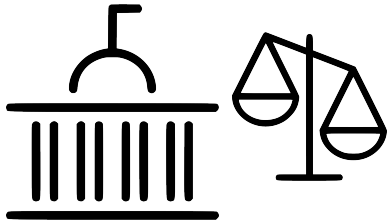
Financial resources
(Mode) ownership
Abilities
Knowledge, habits
Stress
Identity, values
Competing needs
Others' demands e.g.
employers' demands
…

Service & org. context
(Value proposition)



Service design
Business models &
(perceived) opportunities
Interpretation of regulations
Organizational goals
Collaboration
…

Societal, legal &
regulatory contexts



Trends and norms
Taxation
Transportation-related
policies e.g. parking
Urban planning and
land-use policies
…

Adopting an innovation (product or service, or even behavior) is a process

The process is easily disrupted, and users need support throughout this process. (In fact, innovation is a process many organizations need to undertake too.)

Knowledge – Persuasion – Decision – Acclimatization – Normalization – Confirmation

The (potential) adopter evaluates the innovation based on e.g.
relative advantage, complexity, trialability, compatibility, observability, etc.

It is the ***relative advantage*** of MaaS that must be considered, rather than specific socio-demographics or mode-use characteristics. ***MaaS must be perceived as better*** in some way(s), proportionate to the costs (e.g. money, effort) compared to the user's current solution (i.e., relative advantage will differ from user to user).

Contributing service design attributes include:
simplicity and ease of use, improved access, flexibility, convenience, price-worthiness, easy to try, etc.

MaaS cannot be perceived as…
- More expensive (without enough other added value)
- More inflexible, inconvenient, or inaccessible (e.g. "too far away" from infrastructure, needing multiple car seats)
- Too difficult to understand and use, e.g.
  learning how to be a customer incl. onboarding, to use the app, to access vehicles
- Incomplete in some way, e.g. inadequate range of modes, app functionalities, or service features

References: Rogers (2003); Strömberg (2015) open access; Sochor (2021) open access.

Adopting an innovation (product or service, or even behavior) is a process

The process is easily disrupted, and users need support throughout this process. (In fact, innovation is a process many organizations need to undertake too.)

Knowledge – Persuasion – Decision – Acclimatization – Normalization – Confirmation

The (potential) adopter evaluates the innovation based on e.g.
relative advantage, complexity, trialability, compatibility, observability, etc.

Remember what is being asked of (potential) MaaS users.

- understand a new service concept in general (MaaS), as of now largely unobservable and untestable
- understand a specific manifestation of MaaS with a specific, detailed service offer (Service X)
- reflect on one's transport needs and use (probably for the first time)
- estimate how well Service X may or may not match one's needs and use
  (note that transportation use patterns may change due to using the service)
- decide whether (or not) to risk becoming a customer at all, let alone decide how much one is willing to pay
  (note that this may entail dealing with a new service's "growing pains")
- undertake behavioral change (learning to use a new service, test new behaviors *and* potentially reorganize one's life and use of transport
- get everyone on board and coordinate all this with one's household and extended family

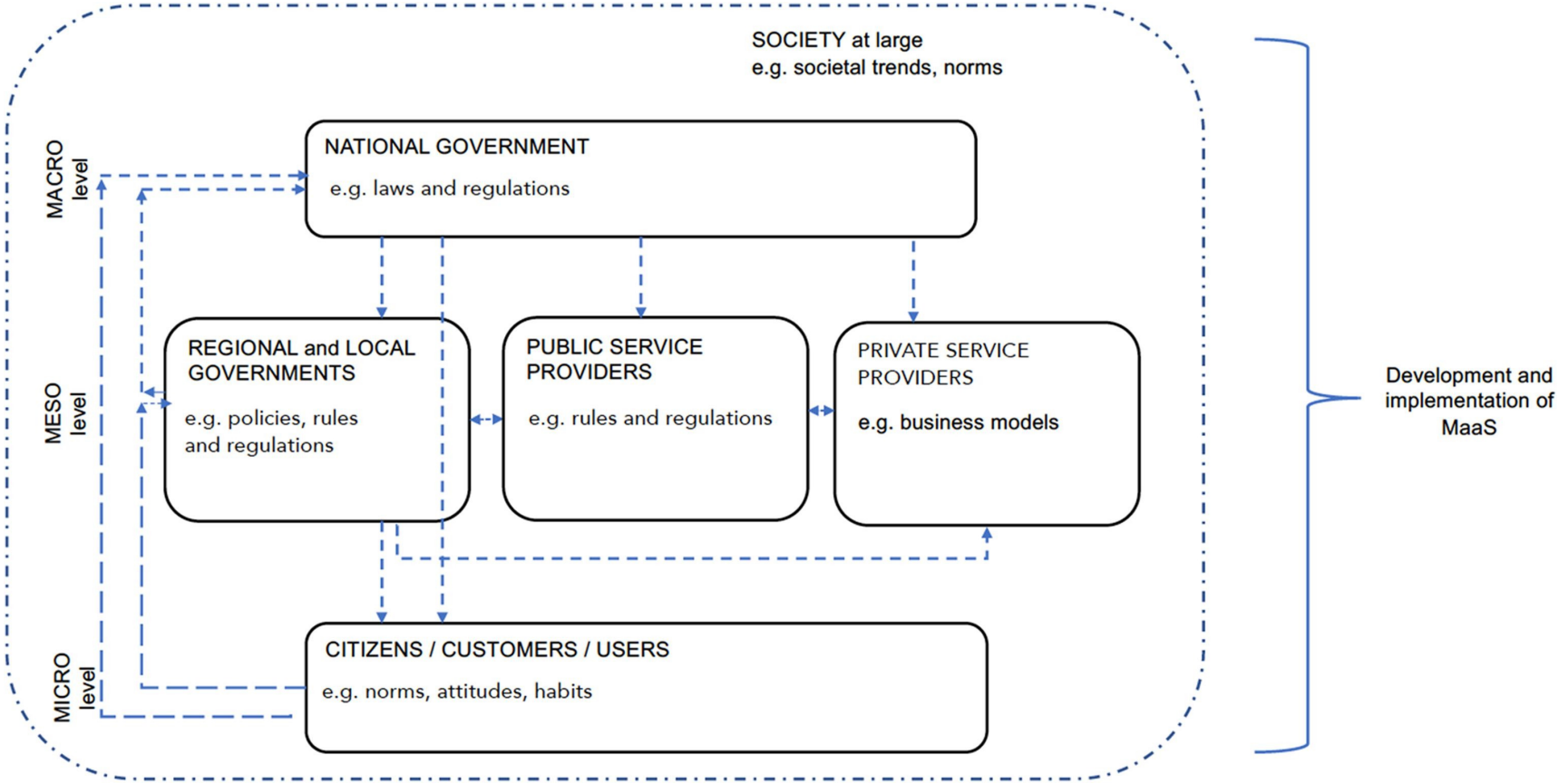
How can we support their change process?

References: Rogers (2003); Strömberg (2015) open access; Sochor (2021) open access.

Implementing Mobility as a Service is complex

And complexities tend to be underestimated, partly due to a lack of experience.

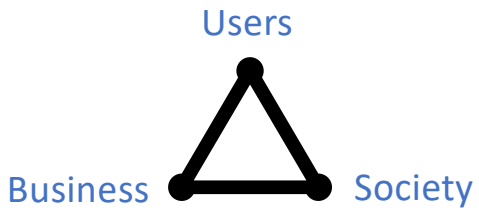
IRIMS analytical framework to identify institutional factors (enablers and barriers) affecting the development and implementation of MaaS



Reference: Karlsson et al. (2020) open access.

Aligning the user, business and societal perspectives

Maximizing matches, minimizing mismatches, identifying gaps. What trade-offs are acceptable and who decides?



Developing MaaS services (& offers) that can meet users' needs and add value, while promoting societal goals. For example:

Users (needs/motives)	Service (offer)	Societal goals
"Everyone"	?	Improve occupancy & utilization rates; increase sharing; shift towards more sustainable modes
People who primarily walk and bike, low costs	?	Avoid inducing demand for less sustainable modes
Multi-modals who use cars semi-frequently or people looking to access cars	?	Offset car purchases
Households looking to downsize, economize, etc.	?	Reduce the number of private cars (selling the secondary or primary car)
Households with limited or no access to a public offer	?	Improve access to the nearest public offer AND/OR increase sharing e.g. P2P

New modes and services often fall between the legal cracks

Many policies and regulations may need to be tweaked or reworked to allow for such services to emerge at scale

What is "public transportation"? (EU regulation on public transportation → *interpreted* into national law / regulation)
- Currently very concrete categories of modes e.g. public transportation, taxi, private car (e.g. in Sweden)
- New shared modes do not fit well into this categorization
- Uncertainty around (perceptions of) public transportation's mission and responsibility, and what they *may* do
- Cultural differences: "Play it safe" versus "Try it out until someone stops us"

Can still be difficult to align perspectives, even within the public sector *(e.g. top-down vs bottom-up approaches, or agreeing on the what but not the how → a danger that good ideas will never be actualized)*

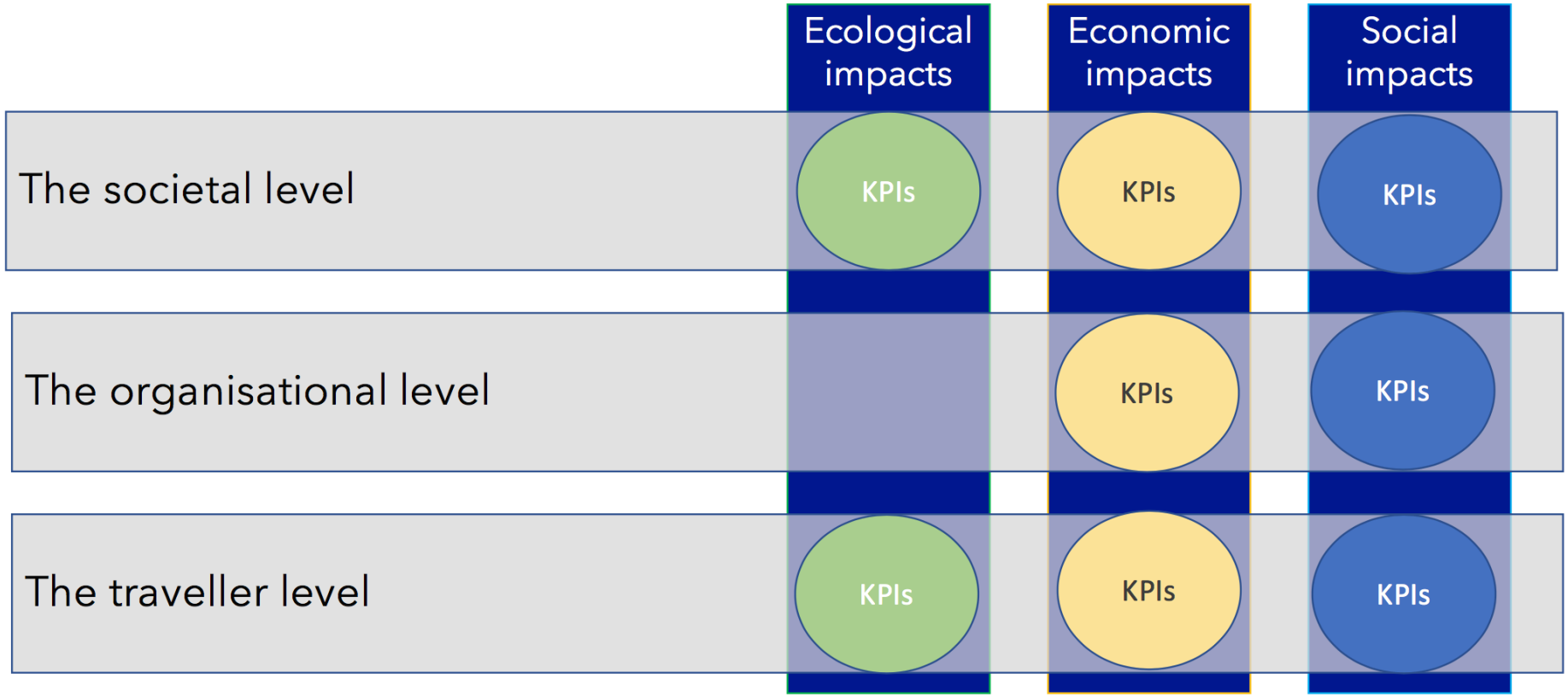
Some problematic and/or gray areas for new services:
- ***procurement procedures*** often suppress long-term collaboration between the public and private sectors
  e.g. lack of flexibility (need to know exactly what you want), time delimited and cannot just continue if it works
- ***taxes and subsidies***
  e.g. different VAT levels for different services; tax deductions reward car use;
  subsidizing company cars instead of a "mobility budget" (from employers or government);
  not possible to subsidize local ridesharing instead of sending out a specialized PT vehicle (e.g. service trips);
  payments levels and income from shared/P2P services (when does it go from being a "hobby" to a "business")
- ***parking*** e.g. parking permits; parking norms; parking for shared vehicles; reserving unused parking spots
- ***insurance*** e.g. for P2P rentals and alternative forms of sharing
- **other** miscellaneous policies
  e.g. shared vehicles being able to use taxi/bus lanes; transporting other people's goods to recycling centers;
  easier identification process for collecting other people's packages for them;

Development of a core evaluation framework for mobility services (KOMPIS)

An open-access tool to support a more standardized and methodological approach

Reference: Karlsson et al. (2020) open access.
http://kompis.me/framework MariAnne Karlsson, coordinator

Building blocks

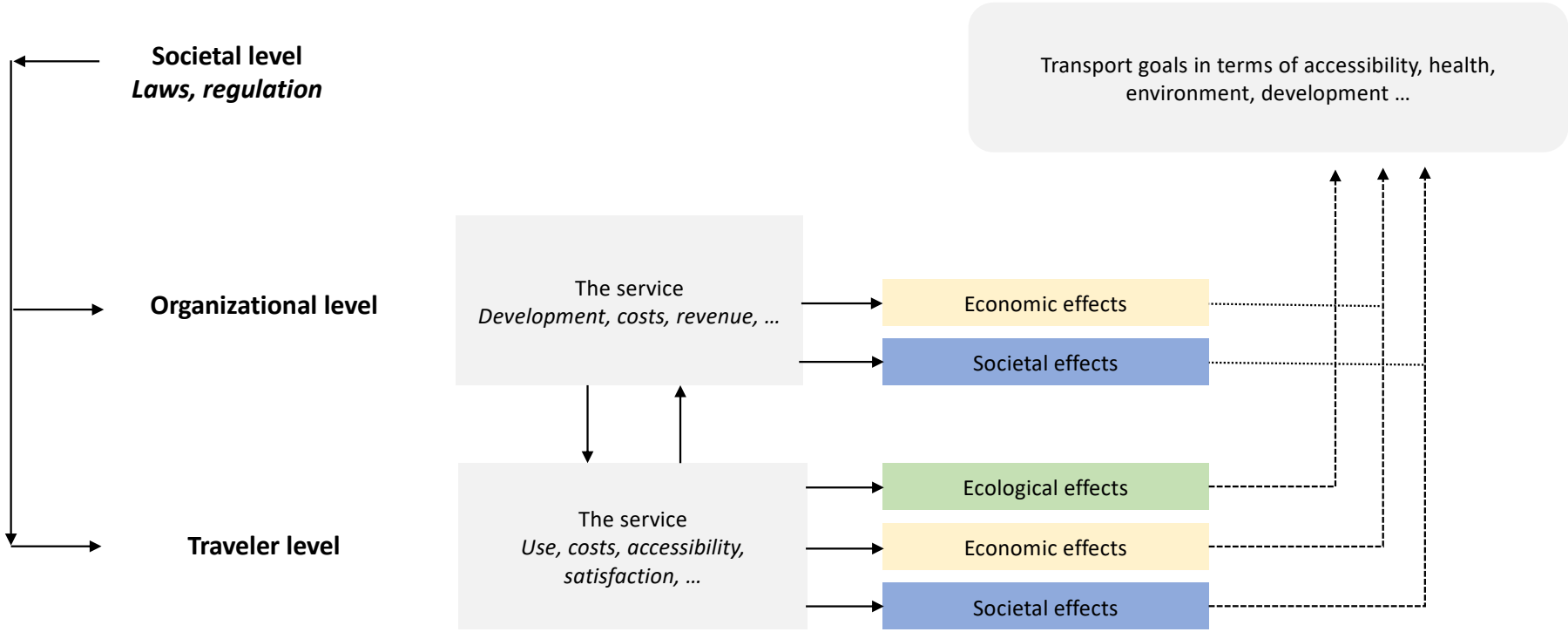


Development of a core evaluation framework for mobility services (KOMPIS)

An open-access tool to support a more standardized and methodological approach

Reference: Karlsson et al. (2020) open access.
http://kompis.me/framework MariAnne Karlsson, coordinator

Overview (models of each level also)



TMR MaaS and Mobility Framework Assessment Tool

The conversation	The Assessments	The Tools
What is the action/activity/project all about? What is it intending to achieve? Who will be involved? Does it pass the initial sifting tests for consideration?	Sifting questions	7 sifting questions
In this locality, what is the user's experience of the mobility system beyond the private car? On which layers in the framework should we be focussing our efforts in this locality?	Mobility Integration (MI)	user experience – transactional, informational and operational integration
How much does this action/activity/project contribute towards delivering the goal of the Enabling Environment?	Enabling Environment (EE)	mobility intermediary transaction information services people, culture, communications
How much does this action/activity/project contribute towards delivering the goal of the Mobility Ecosystem?	Mobility Ecosystem (ME)	mobility services infrastructure and vehicles capability and capacity
How much would this action/activity/project contribute to *improving* the user experience? We do/don't consider this project should be pursued because...	Assessment Summary	Completed summary page for consideration by decision makers.

Reference: TMR, Queensland, Australia (2020).
TMR contact: Paul J Scott

A few (of many) questions for decision makers to ponder

How can we change public policies to be more flexible and agile?
– e.g. What is "public transport" and what may it do?

How do we make private/non-shared/fossil-fueled car ownership and use relatively less advantageous?

How can we encourage and incentivize more sustainable travel behaviors for both those who are already relatively more sustainable and those who are still relatively less sustainable?
– via service design, via urban planning, via public policy, etc.

How can we ensure thorough evaluations of MaaS so that we *all* learn more about what works where and why?
– with enough people, over long enough time, in various geographical and legislative/regulatory contexts
– about traveler behavior, sustainability impacts, service design, conflicts and trade-offs between perspectives and types of sustainability, etc.

How can we better support users throughout the adoption process, including trialing new modes and behaviors?

Thank you!

Jana Sochor, Ph.D.
Senior Researcher

Chalmers University of Technology
Gothenburg, Sweden

jana.l.sochor@gmail.com
jana.sochor@chalmers.se

Examples of MaaS implementation and research projects in Sweden

Go:Smart / UbiGo pilot (B2C)
LIMA (MaaS for employers and employees)
MoJo (MaaS for employees)
EC2B at BRF Viva (MaaS integrated into housing)
Linköping MaaS (city-wide MaaS)
DalMaaS (rural MaaS)
KomILand (rural MaaS)
MaaS Baseline (assessing customer potential in Sweden)
IRIMS (institutional conditions, barriers and enablers)
KOMPIS (Swedish roadmap + pilot support + evaluation framework)
SEAMLESS (sustainability meta-analysis of MaaS service data)
Mistra SAMS research program
MaaSiFiE (European roadmap, CEDR)
IMOVE (unlocking large-scale access, EU H2020)
Stronger Combined (MaaS in rural areas in the North Sea Region, Interreg)
NOMAD (roaming in the Nordic countries, Nordic Innovation)

MaaS RESOURCES – JOURNAL ARTICLES, BOOK CHAPTERS, DISCUSSION PAPERS

- **Sochor, J.** (2021) "Piecing together the puzzle of MaaS: Insights from the user and service design perspectives", *International Transport Forum Discussion Papers,* No. 2021/08, OECD Publishing, Paris. https://www.itf-oecd.org/integrating-public-transport-mobility-service-maas-roundtable
- Smith, G., **Sochor, J.,** Karlsson, I.C.M. (2020) "Intermediary MaaS Integrators: A Case Study on Hopes and Fears", *Transportation Research Part A: Policy and Practice*, 131, pp. 163-177. https://doi.org/10.1016/j.tra.2019.09.024
- Karlsson, I.C.M., Mukhtar-Landgren, D., Smith, G., Koglin, T., Kronsell, A., Lund, E., Sarasini, S., **Sochor, J.** (2020) "Development and Implementation of Mobility-as-a-Service – A Qualitative Study of Barriers and Enabling Factors", *Transportation Research Part A: Policy and Practice*, 131, pp. 283-295. https://doi.org/10.1016/j.tra.2019.09.028
- Smith, G., Sarasini, S., Karlsson, I.C.M., Mukhtar-Landgren, D., **Sochor, J.** (2019) "Governing Mobility-as-a-Service: Insights from Sweden and Finland". In: *The Governance of Smart Transportation Systems: Towards New Organizational Structures for the Development of Shared, Automated, Electric and Integrated Mobility*, M. Finger and M. Audouin (Eds.), Cham: Springer, pp. 169-188. ISBN Print 978-3-319-96525-3, Online 978-3-319-96526-0. https://doi.org/10.1007/978-3-319-96526-0_9
- Smith, G., **Sochor, J.,** and Karlsson, I.C.M. (2019) "Public-private innovation: barriers in the case of mobility as a service in West Sweden". *Public Management Review,* 21(1), pp. 116-137. https://doi.org/10.1080/14719037.2018.1462399
- **Sochor, J.,** Arby, H., Karlsson, I.C.M., Sarasini, S. (2018) "A topological approach to Mobility as a Service: A proposed tool for understanding requirements and effects and aiding policy integration". *Research in Transportation Business and Management*, 27, pp. 3-14. https://doi.org/10.1016/j.rtbm.2018.12.003
- Strömberg, H., Karlsson, I.C.M., **Sochor, J.** (2018) "Inviting Travelers to the Smorgasbord of Sustainable Urban Transport: Evidence from a MaaS Field Trial". *Transportation,* 45(6), pp. 1655-1670. https://doi.org/10.1007/s11116-018-9946-8
- Smith, G., **Sochor, J.,** Sarasini, S. (2018) "Mobility as a Service: Comparing Developments in Sweden and Finland". *Research in Transportation Business and Management,* 27, pp. 36-45. https://doi.org/10.1016/j.rtbm.2018.09.004
- Smith, G., **Sochor, J.,** Karlsson, I.C.M. (2018) "Mobility as a Service: Development scenarios and implications for public transport". *Research in Transportation Economics* 69, pp. 592-599. https://doi.org/10.1016/j.retrec.2018.04.001
- **Sochor, J.,** Karlsson, I.C.M., Strömberg, H. (2016) "Trying Out Mobility as a Service: Experiences from a Field Trial and Implications for Understanding Demand". In *Transportation Research Record: Journal of the Transportation Research Board*, *No. 2542,* Vol. 4, pp. 57-64, Transportation Research Board of the National Academies, Washington, D.C. http://dx.doi.org/10.3141/2542-07
- Strömberg, H., Rexfelt, O., Karlsson, I.C.M., **Sochor, J.** (2016). "Trying on Change –Trialability as a Change Moderator for Sustainable Travel Behaviour", *Travel Behavior and Society*, Vol. 4, pp. 60-68. http://dx.doi.org/10.1016/j.tbs.2016.01.002
- Karlsson, I.C.M., **Sochor, J.,** Strömberg, H. (2016) "Developing the 'Service' in Mobility as a Service: Experiences from a Field Trial of an Innovative Travel Brokerage", In *Transportation Research Procedia*, Vol. 14, pp. 3265-3273. http://dx.doi.org/10.1016/j.trpro.2016.05.273
- **Sochor, J.,** Strömberg, H., and Karlsson, I.C.M. (2015). "Implementing Mobility as a Service: Challenges in Integrating User, Commercial, and Societal Perspectives". In *Transportation Research Record: Journal of the Transportation Research Board*, *No. 2536,* Vol. 4, pp. 1-9, Transportation Research Board of the National Academies, Washington, D.C. http://dx.doi.org/10.3141/2536-01
- **Sochor, J.,** Strömberg, H., and Karlsson, I.C.M. (2015). "The Added Value of a New, Innovative Travel Service: Insights from the UbiGo Field Operational Test in Gothenburg, Sweden". In: *Internet of Things Infrastructures, IoT 2014, LNICST 151*. pp. 169-175, R. Giaffreda et al. (Eds.), New York: Springer. http://dx.doi.org/10.1007/978-3-319-19743-2_26

MaaS RESOURCES – THESES, REPORTS AND WORKING PAPERS

- Karlsson, I.C.M., Akram, A., Sarasini, S., Zhao, X. (2020) Kombinerad mobilitet – Ett ramverk för utvärdering av ekologiska, ekonomiska och sociala effekter av kombinerade mobilitetstjänster.
- Smith, G. (2020) *Making Mobility-as-a-Service: Towards Governance Principles and Pathways*, PhD Dissertation, Chalmers University of Technology, Gothenburg, Sweden. https://research.chalmers.se/publication/516812/file/516812_Fulltext.pdf
- MAASiFiE project funded by CEDR http://www.vtt.fi/sites/maasifie/results (downloadable deliverables and webinar link+pdf) including:
  - Deliverable 2: European MaaS Roadmap 2025.
  - Deliverable 3: Business and operator models for MaaS.
  - Deliverable 4: Impact Assessment of MaaS.
  - Deliverable 5: Technology for MaaS.
- Mukthar-Landgren, D., Karlsson, M., Koglin, T., Kronsell, A., Lund, E., Sarasini, S., **Sochor, J.** & Wendle, B. (2016) Institutional conditions for integrated mobility services (IMS). Towards a framework for analysis. K2 Working paper 2016:16. http://www.k2centrum.se/sites/default/files/fields/field_uppladdad_rapport/institutional_conditions_for_integrated_mobility_services_ims_wp_2016-16_1.pdf

MaaS RESOURCES - REFERREED CONFERENCES (selected)

- Karlsson, I.C.M., Akram, A., Fallahi, S., Sarasini, S., Zhao, X. (2019), "A National Approach to Assessing the Impacts of Mobility-as-a-Service", 2nd International Conference on Mobility as a Service (Tampere, Finland, December 3-4, 2019).
- Smith, G., **Sochor, J.,** Karlsson, I.C.M. (2019) "Adopting Mobility-as-a-Service: An empirical analysis of end-users' behavior and perspectives". 2nd International Conference on Mobility as a Service (Tampere, Finland, December 3-4, 2019).
- **Sochor, J.,** Sundqvist, R., Lindahl, A. (2018) "Potential Customers of MaaS: A Swedish Baseline". 25th World Congress on Intelligent Transportation Systems (Copenhagen, September 17-21, 2018).
- Eckhardt, J., Aapaoja, A., Nykänen, L., **Sochor, J.,** Karlsson, M. (2018) "The European Roadmap 2025 for Mobility as a Service". 7th Transport Research Arena TRA 2018 (Vienna, April 16-19, 2018).
- Sarasini, S., **Sochor, J.,** Arby, H. (2017) "What characterises a sustainable MaaS business model?". 1st International Conference on Mobility as a Service (Tampere, Finland, November 28-29, 2017).
- Nykänen, L., Eckhardt, J., Aapaoja, A., **Sochor, J.,** Karlsson, M. (2017) "The European Roadmap 2025 for MaaS". 1st International Conference on Mobility as a Service (Tampere, Finland, November 28-29, 2017).
- **Sochor, J.,** Arby, H., Karlsson, I.C.M. (2017) "The topology of Mobility as a Service: A tool for understanding effects on business and society, user behavior, and technological requirements". 24th World Congress on Intelligent Transportation Systems (Montreal, October 29-November 2, 2017).
- Smith, G., **Sochor, J.,** Karlsson, I.C.M. (2017) "Procuring Mobility as a Service: Exploring dialogues with potential bidders in West Sweden". 24th World Congress on Intelligent Transportation Systems (Montreal, October 29-November 2, 2017).
- Aapaoja, A., Eckhardt, J., Nykänen, L., **Sochor, J.** (2017) "MaaS service combinations for different geographical areas". 24th World Congress on Intelligent Transportation Systems (Montreal, October 29-November 2, 2017).
- Karlsson, M., Koglin, T., Kronsell, A., Mukthar-Landgren, D., Lund, E., Sarasini, S., Smith, G., **Sochor, J.** & Wendle, B. (2017) "Mobility-as-a-Service: A Tentative Framework for Analysing Institutional Conditions". 45th European Transport Conference (Barcelona, October 4-6, 2017).
- **Sochor, J.** and Sarasini, S. (2017) "More than the sum of its parts? The Finnish Public's Perspectives on Mobility as a Service and ITS". 12th European Congress on Intelligent Transportation Systems (Strasbourg, June 19-22, 2017).
- Eckhardt, J., Aapaoja, A., Nykänen, L., **Sochor, J.** (2017) "Mobility as a Service business and operator models". 12th European Congress on Intelligent Transportation Systems (Strasbourg, June 19-22, 2017).
- **Sochor, J.,** Eckhardt, J., König, D., Karlsson, I.C.M. (2016) "Future Needs and Visions for Mobility as a Service: Insights from European Workshops". Proceedings of the 23rd World Congress on Intelligent Transportation Systems (Melbourne, October 10-14, 2016).
- König, D., **Sochor, J.,** Eckhardt, J., Böhm M. (2016) "State-of-the-art survey on stakeholders' expectations for Mobility-as-a-Service (MaaS)". Proceedings of the 23rd World Congress on Intelligent Transportation Systems (Melbourne, October 10-14, 2016).
- **Sochor, J.,** Strömberg, H., and Karlsson, I.C.M. (2015). "An Innovative Mobility Service to Facilitate Changes in Travel Behavior and Mode Choice". Proceedings of the 22nd World Congress on Intelligent Transportation Systems (Bordeaux, October 5-9, 2015).
- **Sochor, J.,** Strömberg, H., and Karlsson, I.C.M. (2014). "Travelers' Motives for Adopting a New, Innovative Travel Service: Insights from the UbiGo Field Operational Test in Gothenburg, Sweden". Proceedings of the 21st World Congress on Intelligent Transportation Systems (Detroit, September 7-11, 2014).