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Value Creation in Integrated Mobility Services, or Building the 'House of MaaS'

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Abstract. The project Transatlantic Cooperation for Leveling Up MaaS aimed to expand upon the foundational work that proposed the MaaS topology with "levels of integration". Although the topology has helped remedy conceptual confusion and facilitate discussion around MaaS, there is arguably still a gap in understanding MaaS' requirements and effects given what has (not) happened during the past decade – a gap which the project hoped to help fill. The work process utilized interviews, workshops, etc., and culminated in a new, visual model – the 'House of MaaS' – centered on creating value when designing and building integrated mobility services. In it, focus is drawn away from the transport modes and technology/app, although they remain as lower floors upon which to build. Instead, focus is on building upper floors of added values that a service may offer and to whom. For example, user-centric functions providing Guidance, Assurance, or Saving (B2C), as well as business-centric functions providing Management tools (B2B). It is the authors' hope that, similar to the topology, this 'House of MaaS' model will provide another simple yet powerful tool to help guide service developers, practitioners, policy makers, and researchers in their efforts related to service design and value creation for MaaS users.

Keywords: Integrated Mobility · MaaS Mobility as a Service · Multimodal · Value Creation · Service Design

1 Introduction and Background

Mobility as a Service (MaaS) has been characterized as an innovation aimed at addressing issues related to sustainable mobility by providing an alternative to private car ownership. It involves various levels of integration (e.g., trip planning, booking, payment, and ticketing) of different mobility services into a unified, convenient package accessible to users through a smartphone application [1]. In the decade plus since the concept of MaaS went mainstream, both a little and a lot have happened, and many pre-conceived notions and expectations have fallen by the wayside; typical in the 'fluid', experimental phase of innovation [2]. For example, Business-to-Consumer (B2C) MaaS services for

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the general public (e.g., UbiGo and Whim, or 'Level 3 MaaS' according to [1]) have not become ubiquitous as originally envisioned, and collaboration models have proven elusive. Other mobility services, e.g. many public transport services, have become more MaaS-like (cf. Level 2 MaaS with integrated ticketing and payment [1]) and/or multimodal (e.g. linking to additional mobility services). And more targeted efforts have emerged within specific customer segments and/or locations, e.g. tourists/tourist destinations or Business-to-Business (B2B) services for employers/employees and residential complexes.

In terms of state-of-the-art research into MaaS, the topics have ranged from governance and policy, ecosystems and business models, technology and standards, and innovation, to evaluation and sustainability impacts, future studies and transport models, and analysis of users'/customers' behaviors and preferences (see e.g [3–13].). However, despite the many MaaS initiatives and growing body of research, uncertainties remain during this period of change on what exactly MaaS could become, how to achieve and sustain it, and how it can best fulfill societal goals.

This paper presents results from the project Transatlantic Cooperation for Leveling Up MaaS, funded through the Swedish Innovation Agency's Future Mobility Program. The project focused, in part, on expanding upon the foundational work from 2016 that proposed the "topological approach to MaaS" and "levels of integration" [1]. That topology had set out to remedy the then conceptual confusion around MaaS, facilitate discussions on the MaaS concept, and account for MaaS' requirements and the effects on society, business, users/customers and technology. The authors of this paper, who also authored [1] (hereby 'we' or 'us'), submit that the original topology has essentially achieved the first two goals (remedy confusion and facilitate discussion) through its development of a shared vocabulary. It has proven to be an important tool, evidenced by its adoption and application by researchers, public agencies, mobility service providers, and private sector stakeholders.

However, the third goal – understanding MaaS' requirements and effects – has arguably not been fully achieved considering what has (not) happened with MaaS in the past decade. Thus, we felt a need to revisit the topic and the topology, to potentially help further this goal. The final output, presented below, is a proposed model to help MaaS stakeholders (re)focus on value creation when designing and building integrated mobility services, so as to improve their relevance for end users and business customers. In other words, the model visualizes how to build the 'House of MaaS'.

2 Method

The work to 'revisit the topology' was anchored, theoretically and empirically, in desktop studies, interviews, workshops, etc., as outlined below. The work was partly exploratory as it was unclear from the start if the final output for the work package would be a 'new' or expanded topology, or something completely different. We tried to keep open minds given that we had worked to develop the original topology and have worked with MaaS (or similar before it was called MaaS) since. As such, it was vital to gather viewpoints from other MaaS and mobility experts, both researchers and practitioners.

Initially, a **desktop study** gathered secondary data to explore the rise and fall of various MaaS services to create an overview of what has happened, empirically, over

the past decade plus, as well as to provide a picture of the current services in existence. In parallel, an **interview study** gathered primary data from MaaS experts (researchers, consultants, and practitioners) working in nine countries to gather insights on the state of the art as well as reflections over the past decade. A total of eighteen semi-structured interviews (six researchers, four consultants, and eight practitioners) provided input for the subsequent work. The interview guide for the researchers and consultants focused on questions such as: What has happened (or not) with MaaS over the past decade?; What have we learned (or not)?; How have you utilized the topology?; and How has the topology been useful and how can it become more useful? For the practitioners, the interview's focus was broader, on their organization's work with MaaS (and mobility) over the past few years, including challenges and lessons learned. Additionally, **observations from MaaS- and mobility-related conferences and events** (e.g. TRA, TRB, ITSWC, Thredbo, UC Davis 3RFM Research Workshop, MaaS Europe) were gathered, such as; What were the topics, challenges, and possibilities being discussed (or not)? Throughout the project, **internal project meetings** discussed the latest findings from the ongoing primary and secondary data collection efforts, including identifying themes, gaps, and trends, as well as brainstorming ideas regarding a new or modified topology or model.

To develop the final output, two half-day **internal workshops** (A and B) with the three authors were conducted in the spring of 2025. We adopted a similar approach to that of the workshop in 2016 [1] (which two of us had organized, documented, and participated in). In Workshop A, aspects (characteristics, functions, features, etc.) of MaaS were listed, although not according to any particular perspective (e.g. society, business, user) as in the 2016 workshop. In other words, what does one see when one looks at MaaS services, how they work, and what they offer. Then, the identified aspects were tabulated against four different MaaS services, chosen based on the participants' knowledgeability regarding the services' value offerings and business models, likely familiarity to a wider audience, and variation from each other. As in the original workshop in 2016, this step was intended to be illustrative yet informative, rather than exhaustive. Finally, based on this, thematic clusters emerged (e.g. that MaaS now appears to necessitate a minimum, 'core' service including booking, ticketing, and payment), which will be further explained in the Results section. The participants were then to reflect upon the first half-day's findings including potential visualizations in preparation for the second half-day.

In Workshop B, two weeks later, the first version of the 'House of MaaS' model was developed – entailing working with visualization concepts and discussing the included elements (e.g. the thematic clusters identified in Workshop A), e.g. denominations, placement, content, etc. We then circled back and asked for feedback from several experts either interviewed in the project or involved in the 2016 workshop. Of those who responded, two had specific suggestions or comments. Subsequent modifications to the visualization were discussed by the authors via email or phone.

3 Results and Discussion

This section will first focus on what has (not) happened in the past decade and why, based on findings from the desktop and interview studies. Then, the project's final output is presented, namely the new 'House of MaaS' model that focuses on value creation in integrated mobility services.

3.1 A Decade of MaaS – Results from the Desktop and Interview Studies

The desktop study came to five key points to summarize why MaaS has not emerged as envisioned. The industry created a *hype,* for better or worse. On the 'for worse' side, expectations became too high regarding speed and ease of implementation, impact, profitability, etc.; and too much *infighting* directed focus to who should be the operator instead of to the service offer. The investment money was there to build the technology, instigating *'repetitive pilot syndrome'*, but *focusing on the technology* (a 'nice app') per se failed to create value for enough users. Thus, it has proven *hard to find viable business models.* While the value of a one-stop-shop is more obvious for business or leisure trips, for everyday trips in one's own town it is less so.

Many of these points (among others) also arose during the expert interviews. One repeated point was that any focus on users had fallen by the wayside as the industry focused on the technology/app, and that the industry is still learning how to incentivize changes in travel behavior. Additionally, needing to learn more about the interplay and impacts *among* digital and physical infrastructures (e.g. mobility hubs), as well as developing mobility and multimodality for different geographies. From the organizational perspective, the mobility sector/actors are also slow to change. Collaboration is still not easy, nor is finding someone willing to do the hard work even if others benefit. There remains a lack of alignment even within the public sector, as well as a lack of system-level thinking and achieving societal goals.

On a more positive note, the experts felt that financial seamlessness and data exchange and standards have improved; and that the transport industry has (re)learned that it is hard to change travel behavior. Cities have recognized that potential conflicts need to be managed, e.g. how to allocate space, and that added services can make public transport more attractive. MaaS has shifted away from B2C due to high acquisition costs and is now finding niche markets.

The desktop study concluded that MaaS has shown there are many ways – both physical and digital – of offering easier access to mobility services that can compete with car ownership, support a more multimodal lifestyle, and contribute to changed attitudes and behavior. It seems likely that MaaS will follow the typical hype curve out of the 'trough of disillusionment' into the 'plateau of productivity' as companies realize there is not one general, cookie-cutter solution and move to explore business opportunities in niche markets and add revenue streams; e.g. mobility benefits for employees (cf. Skipr), MaaS for residential complexes (cf. EC2B), MaaS for tourists (e.g. local tourism industries subsidizing a service to attract non-car visitors and offer better on-site mobility), non-mobility actors including mobility in their offer, etc. Other solutions can also offer value, such as: mobility wallets allowing 'sponsorship' from government or employers, mobility hubs, district-based mobility marketplaces, collaboration via roaming, AI-based

'personal secretaries', etc. The future of MaaS is likely a more flexible landscape than originally envisioned a decade ago.

3.2 The 'House of MaaS' Model Focusing on Value Creation

The result of the internal workshops, the final output, is visualized in the new 'House of MaaS' model, focused on value creation, and where the value-adding functions are categorized into three end user/customer-centric 'rooms' (*Guidance, Assurance, and Saving*), and one business customer 'attic' (*Management*) (Fig. 1).

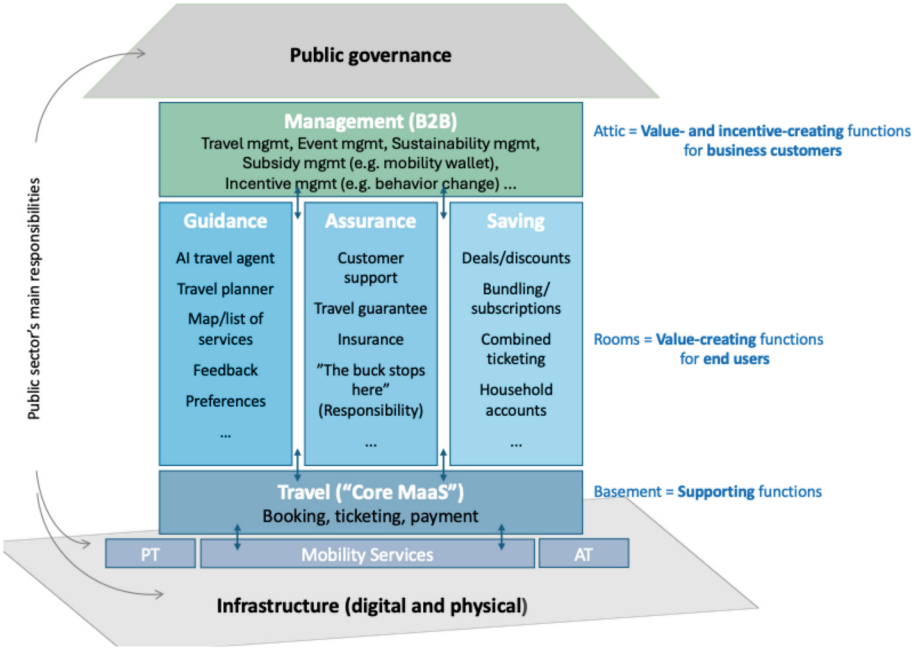


Fig. 1. A visual model of value creation in integrated mobility services, or the 'House of MaaS' (developed by Sochor, Karlsson, Arby, 2025).

From the ground up, all mobility services rely on access to different kinds of physical and digital infrastructure that they share with private vehicles and road users that are not (always) mobility service users. Public transport is typically different than other shared mobility services as it is often a publicly controlled and subsidized monopoly. As such, it is also a tool for governance through terms and conditions in a reselling agreement. Public space is also a monopoly that authorities can use to enable and regulate mobility services.

Next, the local mobility ecosystem – the mobility services, as well as public transport (PT) and active transport (AT) – creates the foundation upon which any 'House of MaaS' will be built. Note that the foundation of mobility services is wider than the elements

above it – core/basement, rooms, attic – as not all local mobility services may be included in a MaaS service.

The basement of the house represents 'Core MaaS' – booking, ticketing, and payment services that offer access to multiple transport modes. These services may be fully integrated, or handled in a more distributed or modular fashion, as long as the experience is seamless for the user. After more than a decade of development, these functions arguably form a minimum requirement for a service to be considered MaaS. Together with the available mobility services, they provide 'Travel', the fundamental benefit of MaaS. However, in practice, the basement alone has proven insufficient to create enough added value to attract users to a MaaS service. Instead, the basement is the fundamental basis that enables additional functions that can create added value to attract users/customers by providing (in our case) Guidance, Assurance, and Saving. Furthermore, additional value for business customers can be created by adding an "attic", representing management functions (Management).

- *Guidance* – Guidance functions create value by supporting users, proactively or reactively, in navigating the mobility system, accessing the available mobility services, simplifying decision making, and identifying the most suitable travel option for their needs. Examples are tools such as planners synced with users' calendars and multimodal journey planners that can help users choose the 'right' alternative depending upon their priorities such as time, convenience, cost, or environmental impact. Such tools may be considered a core function, but are not necessary for commuter or other familiar daily journeys. Their particular value emerges when planning and undertaking unknown trips (cf. Level 1 in [1]). These functions enable users to realize value by reducing cognitive effort [14] and uncertainty in planning and executing trips.
- *Assurance* – Assurance functions address the need for reliability, trust and support throughout the service experience. Being able to find, book and pay for using a service does not necessarily guarantee that that the service will function as expected or that support will be available when needed. From a service design perspective, assurance mechanisms such as customer support [15, 16], travel guarantees, and insurance (cf. Level 3 [1]) but also privacy preservation [17] contribute to creating value in use by reducing perceived risk and increasing confidence in the service system [1].
- *Saving* – For MaaS to be attractive and relevant, they must also generate tangible benefits for users. There must be a 'good deal' – something to be saved, whether money [15], time, effort [14] or something else. Furthermore, pricing models (e.g. pay-as-you-go or subscription-based bundles) that align with users' mobility needs and lifestyles, including those of households, can further increase perceived service value [18, 19].
- *Management* – A user can be a customer but is sometimes 'just' a user if somebody else is paying for the trip (like an employer), or the trip is part of an event ticket or larger package. Functions here create value for organizations by being able to see over business trips, incentivize sustainable choices, follow up the usage of mobility budgets (directly, or indirectly through mobility wallets), create event or visitor packages, etc. If well-designed, such B2B functions should also add different types of value to the other MaaS stakeholders, e.g. the end users in the rooms, MaaS provider in the basement, MSPs in the foundation, and society. Furthermore, the functions in

the rooms create value for the organization by enabling management functions. This value trickling up and down is indicated by arrows in the model.

And finally, there is *Governance* – the roof of the House – by which public authorities can intervene to achieve more socially, ecologically and economically sustainable outcomes using various tools targeting the combined or individual mobility services, users, geographies etc. Examples include subsidizing, taxing, regulating, enabling, and licensing.

4 Concluding Remarks and Recommendations

This paper has presented results from the work package "Service Innovation in the development of MaaS", which culminated in the 'House of MaaS' visual model (Fig. 1) focusing on value creation when building integrated mobility services. Value can be created via user-centric functions providing Guidance, Assurance, and Saving (and perhaps other categories) in a B2C service, as well as business-centric functions providing Management tools (in the case of a B2B service). In this model, focus is drawn away from the technology – the app – although it remains at the core as a tool upon which to build. Instead, focus in drawn towards what added values the service may offer and to whom. As such, it helps address the need for broader conceptualizations of innovations, going beyond the specific technology or solution in order to "explain [its] potential impact on the people [that] experience and innovate with services" [20].

Aside from providing a point of common reference and discussion regarding MaaS, the interviewed experts felt the original MaaS topology [1] had proven to be a simple yet powerful explanatory tool that had supported their conversations with other stakeholders not as familiar with MaaS. For example, it helped provide a structured approach and narrow down what one is (not) talking about, identify where an organization is now and where they want to go, explain potential development processes, etc. As such, it is the authors' hope that this new, refocused 'House of MaaS' model will similarly help guide MaaS developers, practitioners, policy makers, and researchers in their efforts related to service design and value creation for MaaS users.

References

1. Sochor, J., et al.: A topological approach to mobility as a service: a proposed tool for understanding requirements and effects, and for aiding the integration of societal goals. Res. Transp. Bus. Manag. **27**, 3–14 (2018). https://doi.org/10.1016/j.rtbm.2018.12.003
2. Abernathy, W.J., Utterback, J.M.: Patterns of industrial innovation. Technol. Rev. **80**, 1–9 (1978)
3. Lyons, G., et al.: The importance of user perspective in the evolution of MaaS. Transp. Res. A Policy Pract. **121**, 22–36 (2019). https://doi.org/10.1016/j.tra.2018.12.010
4. Mukhtar-Landgren, D., Smith, G.: Perceived action spaces for public actors in the development of mobility as a service. Eur. Transp. Res. Rev. **11**(1), 1–12 (2019). https://doi.org/10.1186/s12544-019-0363-7
5. Hensher, D.A., et al.: Understanding Mobility as a Service (MaaS): Past Present and Future. Elsevier Science, United Kingdom (2020)

6. Hesselgren, M., et al.: Understanding user practices in mobility service systems: results from studying large scale corporate MaaS in practice. Travel Behav. Soc. **21**, 318–327 (2020). https://doi.org/10.1016/j.tbs.2018.12.005
7. Karlsson, I.C.M., et al.: Development and implementation of mobility-as-a-service–A qualitative study of barriers and enabling factors. Transp. Res. A Policy Pract. **131**, 283–295 (2020). https://doi.org/10.1016/j.tra.2019.09.028
8. Pangbourne, K., et al.: Questioning mobility as a service: unanticipated implications for society and governance. Transp. Res. A Policy Pract. **131**, 35–49 (2020). https://doi.org/10.1016/j.tra.2019.09.033
9. Alyavina, E., et al.: Mobility-as-a-service and unsustainable travel behaviour: exploring the car ownership and public transport trip replacement side-effects of the MaaS paradigm. Transp. Policy. **150**, 53–70 (2024). https://doi.org/10.1016/j.tranpol.2024.03.001
10. Ho, C., Tirachini, A.: Mobility-as-a-service and the role of multimodality in the sustainability of urban mobility in developing and developed countries. Transp. Policy. **145**, 161–176 (2024). https://doi.org/10.1016/j.tranpol.2023.10.013
11. Kriswardhana, W., Esztergár-Kiss, D.: University students' adoption of mobility as a service with respect to user preferences and group differences. J. Public Transp. **26**, 100079 (2024). https://doi.org/10.1016/j.jpubtr.2023.100079
12. Chen, X., et al.: Understanding bundle choices and subscription patterns of mobility as a service (MaaS) trial participants: evidence from an Australian university community. Travel Behav. Soc. **42**, 101123 (2026). https://doi.org/10.1016/j.tbs.2025.101123
13. Caiati, V., Pasimeni, F.: Promises, pathways, and pitfalls: tracing a decade of mobility as a service research. Transp. Res. Interdiscip. Perspect. **37**, 101942 (2026). https://doi.org/10.1016/j.trip.2026.101942
14. Hensher, D., Xi, H.: Mobility as a service (MaaS): are effort and seamlessness the keys to MaaS uptake? Transp. Rev. **42**(3), 269–272 (2022). https://doi.org/10.1080/01441647.2022.2044590
15. Karlsson, I.C.M., et al.: Developing the 'service' in mobility as a service: experiences from a field trial of an innovative travel brokerage. Transp. Res. Procedia. **14**, 3265–3273 (2016). https://doi.org/10.1016/j.trpro.2016.05.273
16. Smith, G., et al.: Mobility-as-a-service users: insights from a trial in Sydney. Eur. Transp. Res. Rev. **15**(1), 40 (2023). https://doi.org/10.1186/s12544-023-00612-2
17. Huang, S.: Listening to users' personal privacy concerns. The implication of trust and privacy concerns on the user's adoption of a MaaS-pilot. Case studies on. Transp. Policy. **10**(4), 2153–2164 (2022). https://doi.org/10.1016/j.cstp.2022.09.012
18. Ho, C., et al.: Drivers of participant's choices of monthly mobility bundles: key behavioural findings from the Sydney mobility as a service (MaaS) trial. Transp. Res. Part C Emerg. Technol. **124**, 102932 (2021). https://doi.org/10.1016/j.trc.2020.102932
19. Reck, D., et al.: MaaS bundle design. Transp. Res. A Policy Pract. **141**, 485–501 (2020). https://doi.org/10.1016/j.tra.2020.09.021
20. Lusch, R.F., Nambisan, S.: Service innovation: a service-dominant logic perspective. MIS Q. **39**(1), 155–176 (2015). https://doi.org/10.25300/MISQ/2015/39.1.07

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