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Introducing TrønderMaaS: investigating business models, sustainability and users' acceptance of a MaaS system in Stjørdal and Trondheim region, Norway

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Abstract

This paper describes the aim, methodology, objectives and expected impacts of a project proposal submitted to the Research Council of Norway in April 2019.

TrønderMaaS assesses the implementation of Mobility as a Service (MaaS) solutions in Norway using multiple perspectives, focusing on business models, users' acceptance and environmental impact.

The assessment will be performed through a full-scale Pilot Test in the Trondheim-Stjørdal region, testing several business models, pricing strategies and operational conditions. Researchers will work with the technology development partner and local transport providers to develop a MaaS app/platform prototype that will offer a multimodal travel solution for a limited period. Users involved in the test will actively participate to the assessment through interviews, surveys and direct feedback. Public Authorities will help in the assessment by giving support and feedbacks during the project development.

Future results of the project will foster the development of integrated mobility throughout Norway, and beyond.

Keywords: Mobility as a Service; Business Model; Users' Perspective; Sustainability.

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1. Introduction

Demand for road transport in Norway is increasing. From 2010 to 2017, the number of passengers and the kilometers travelled on Norwegian roads has increased by 13.7% and 12.9% respectively. This increasing trend is also consistent for private passenger cars (+11.9%) (Statistics Norway, 2019). Mobility as a Service (Fig. 1) is rising as a new mobility model which has the potential to tackle this problem, aiming to make travelling on a backbone of public transportation much more convenient and easier by integrating door-to-door trip planning, booking, ticketing and payment services for all transport modes in a single mobile phone or web-based app (Goodall et al., 2017).

The TrønderMaaS projects aims to increase the knowledge on MaaS by testing it in the Trondheim-Stjørdal region, focusing on three aspects of particular interest: users' perspective, business models and environmental impact.

Whether or not a technology innovation will be widely and successfully applied depends heavily on the user acceptance, but there are only a few previous studies focusing on the user perspective related to MaaS use (Sochor et al., 2016). Therefore, there is a need for further research, especially considering large and representative samples of potential users.

MaaS involves several stakeholders, each one providing a component into the jointly offered mobility solution (Jittrapirom et al., 2017), therefore a lack of understanding regarding the business model perspective could prevent localities from successfully implementing MaaS systems. Despite the importance of this understanding, most literature on MaaS has focused on the technological and planning aspects of implementing MaaS, while scant attention is put on business model aspects (Jittrapirom et al., 2017).

Lastly, MaaS can contribute to environmental sustainability by potentially reducing the number of personal vehicles on the road network. Nevertheless, environmental sustainability is not a guarantee, since a MaaS system which acts in competition with public transport systems and/or attracts users from already sustainable modes such as cycling and walking, may in fact result in adverse environmental sustainability consequences (Pitera and Marinelli, 2018). Therefore, TrønderMaaS aims to fill this lack by aiming to make more focused and quantified research in that topic.

2. Research questions & methodology

The main hypotheses of the project are that (1) it is possible to individuate and select a proper business model, among all those available, that can satisfy all the stakeholders involved in MaaS in a specific application or location, (2) a user-tailored solution can ignite the user adoption of MaaS and (3) MaaS is a viable solution for reducing car usage, climate-gas emissions and pollution.

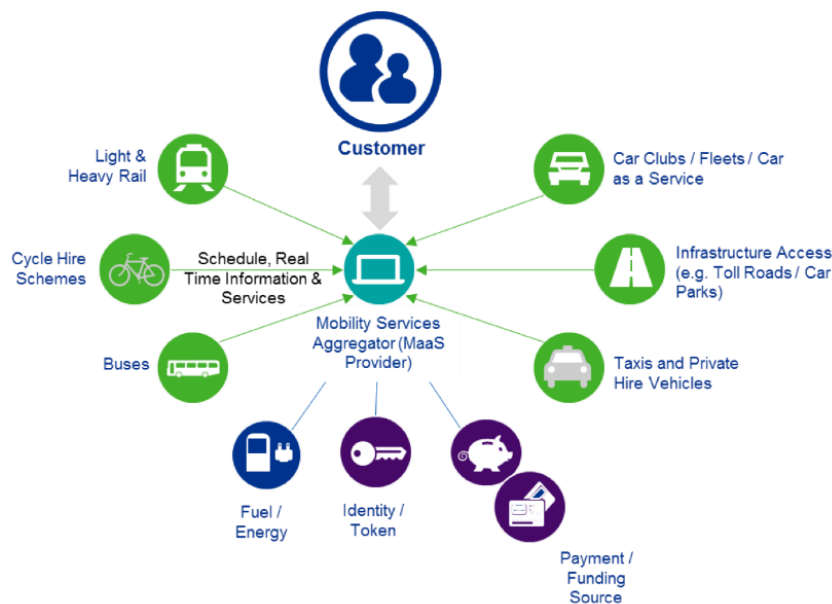


Fig. 1 Mobility as a Service concept (source: <http://www.transportknowledgehub.org.uk>)

To accept or reject these hypotheses, the following research questions shall be investigated:

- R1: What are the current needs of the travelers to make daily traveling more convenient, economic and environmentally friendly?
- R2: What psychological factors (attitudes, norms, perceived benefits and barriers etc.) predict intention to use a MaaS platform both among the car-users and non-MaaS users?
- R3: What is the role of demographic factors and knowledge about MaaS for predicting the intention to use a MaaS app?
- R4: What are the user experiences and satisfaction levels after using the MaaS app/system for a trial period?
- R5: What are organizations' key issues for participating in MaaS in the future?
- R6: How to promote good interaction and management between the organizations in the project?
- R7: How can the environmental impact of a MaaS system be quantified?
- R8: How does operational aspects of MaaS impact mode-shift (car/kms) and GHG emissions (person/kms), comparing before and after travel behavior?
- R9: What operational components of a MaaS are important to ensure environmental sustainability?

The TrønderMaaS project strongly relies on the implementation of a Pilot Test, which will be designed based on relevant theoretical methodologies for each aspect of the project: user perspectives, business models & cooperation strategies, and environmental impact.

User perspectives will be investigated through surveys and interviews, both before, during, and after the Pilot Test. Statistics will be also collected through the app/platform and analysed to understand preferences and behaviours. Regarding the business models, a deductive research approach, from state-of-the-art theory to empirical research will be implemented. Additionally, qualitative research according to Bryman (2016) will be performed through semi-structured interviews with different stakeholders in the sector. It will be possible, through a theoretical approach, to develop a model for partnering involvement that could help the different stakeholders involved in the MaaS system to develop a shared and agreed upon business model, compatible with the specific situation and location, and that fits all the different business needs.

The environmental impact will be analysed through before and after travel behaviour surveys, in conjunction with user perspective surveys and travel data collected through the MaaS app. Different system configurations tested within the pilot will be modelled using a metrics of emissions production (CO₂ and NO_x) per person-kilometre and mode shift, including vehicle-kilometres travelled.

3. Objectives and expected impacts

The main objectives of TrønderMaas project are strongly aligned with the three main focus of the project.

- OB1: To increase the use of future MaaS systems by examining the psychological antecedents (e.g. attitudes, perceived risks) of MaaS use and user experiences and satisfaction within the trial period. Focusing on the factors related to user perspective both before and after the trial period is expected to provide useful insights on how to increase MaaS use.
- OB2: To highlight the needs of potential new users and investigate how the public and private companies can jointly develop a mobility service to benefit the end user while selecting and jointly employing the sound business model that the companies agree on for that specific MaaS system.
- OB3: To understand how the components of a MaaS system (such as offerings, pricing structure, information, and incentives) can encourage environmentally sustainable MaaS operations. This understanding includes investigating how a MaaS system should be developed and operated in order to attract drivers to the system (as opposed to pedestrians and cyclists) and promote heavy use of public transport components of the system.

The impact of the project has been examined within the context of the UN Sustainable Development Goals (SDG).

TrønderMaaS's main objectives have been compared with the targets of all the SDGs and the partner group has agreed on 5 different targets from 4 different SDGs (Fig. 2).

The targets that the TrønderMaaS project will address include the following:



Fig. 2 The four SDGs that TrønderMaaS project addresses

- SDG 3.6: “[...] halve the number of global deaths and injuries from road traffic accidents”
TrønderMaaS addresses this SDG by contributing to the implementation of MaaS, which directly encourage a mode shift away from private vehicle usage and may have an impact on reducing accidents.
- SDG 9.1: “Develop quality, reliable, sustainable and resilient infrastructure [...]”
TrønderMaaS addresses this SDG by promoting the development of new mobility solutions that allow for better efficiency and quality in the transport systems, assures reliability and increased resilience through live data technology, and enhances sustainability through reduced private car usage.
- SDG 11.2: “[...] provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport [...]”
TrønderMaaS addresses this SDG by encouraging the use of Public Transport within MaaS: it improves mobility by increasing flexibility, reliability, safety and multimodality.
- SDG 17.16: “Enhance the global partnership for sustainable development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the sustainable development goals in all countries, in particular developing countries”
- SDG 17.17: “Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships”
TrønderMaaS directly addresses SDGs 17.16 and 17.17 by investigating proper business models and shared strategies among private and public actors and that implement technology and expertise towards sustainable development. While these models and strategies are investigated within a Norwegian context, it is expected the results will be geographically transferable.

4. Expected results

The expected results for this project will be mainly included in the final reports and they can be identified as the following:

- Evaluation of different business models and pricing strategies in terms of financial sustainability for the Transport Providers joining the MaaS system
- Draft for possible cooperation agreements between TPS and MaaS coordinator
- Evaluation of users’ perspective, interest, in order to design a user’s tailored solution
- Quantitative environmental analysis of before/after MaaS trial
- Suggested strategy-plan to guarantee sustainability in MaaS implementation

Furthermore, a MaaS platform prototype will be developed and tested in real case scenario and leading to useful results to eventually being implemented in a following business development phase.

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