

## **A Socio-Technical User Based Perspective for Urban Transport Solutions - The Fjordbus Case**

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### **Article summary:**

In Aalborg, Denmark the Center for Logistik og Samarbejde (CLS) and several organisations have been working since 2019 on the design of an autonomous passenger ferry (Fjordbus). The Fjordbus will initially sail between Musikens Hus and the new urban area in Stigsborg. The primary purpose of the Fjordbus is to become a transport solution to connect the population of Aalborg and Nørresundby. The Fjordbus will transport around 25 people and it will carry onboard objects such as baby carriages, bicycles, and wheelchairs.

Among the several designs and construction innovations revolving around the Fjordbus, two technical components are worth mentioning. The first innovation is the autonomous navigation system. It comprises of several sets of cameras, sensors, and tracking devices that detect and classify objects according to their proximity and size. The system has been tested at the Limfjord in Aalborg and at the fjord of Faaborg under different weather and lighting conditions. The second innovation is a fossil-free engine that will not generate CO<sub>2</sub> emissions, making it environmentally sustainable and cost-effective in terms of fuel usage. Currently a prototype vessel for testing is being constructed by Tuco Marine Group. It is expected to be sailing along the Limfjord by the last quarter of 2021.

The novelty of autonomous transport imposes technical, institutional, and social challenges. The complete development of a fully autonomous system capable of operating without direct human intervention needs further research, testing, and funding. Institutionally, it requires proposing, discussing, and socialising the regulations and legal liability for autonomous transport. As for the social challenges autonomous transport creates, an aspect that needs considering is how people will define and integrate autonomous transport into their daily activities.

We think that these challenges occur simultaneously and therefore require a multidisciplinary approach for the successful implementation of the Fjordbus. The technical and institutional aspects of autonomous navigation are being researched and discussed at a national and international level. However, there is a knowledge gap on the potential users of autonomous transport solutions in urban contexts.

We have defined the combination of the potential user's empirical contributions with the technical and institutional features as a *socio-technical user-based development approach*. In this article, we analyse how the potential users of the Fjordbus imagine a future of urban transport with the Fjordbus as part of it. We also identify basic aspects of the daily transport practices of the inhabitants of Aalborg and Nørresundby.

The theoretical focus is based on two notions. The first is that non-human actors such as technologies, regulations, and structures have agency as a human actor. The second notion is that the study of people's interactions with transport creates a social transport practice in which they interact with human and non-human actors, while creating an array of knowledge, sensations, and thoughts.

As for the methodology, we conceived two paths to understand the daily life experiences of people when travelling. The first one was through workshops during which the participants imagined their travelling experiences, expectations, and concerns when travelling on the Fjordbus. The second approach was a survey in which the respondents were asked about their current transport practices and their opinions about the Fjordbus as part of their daily activities.

The method used for the workshops was the so-called "Future Workshops" technique. This method promotes creativity among the participants as it makes them face dilemmas that they have to solve by suggesting solutions through drawings or in writing. To foster the discussion, we designed four cards, each depicting a specific scenario. The participants were asked to either defend the scenarios or create alternatives to them.

The workshops results were categorised according to three dimensions: (1) Sustainable transport practices and transport integration; (2) Moving stops and passenger experience; and (3) The daily life topics of weather and waiting times.

As far as the survey, it allowed to gather empirical information about people's perceptions of the Fjordbus as a means of public transport. It also allowed to shed some light on the respondents' transport habits for commuting, shopping, and leisure activities.

The results of the survey were analysed by dividing them into three sections: (1) The Fjordbus Users' Preferences when Crossing Limsfjordbroen; (2) Potential users' Transport Practices; and (3) Perceptions Towards the Fjordbus.

Finally, the interpretations of the results of the workshops and the survey were incorporated into a three-dimensional socio-technical approach that combines the autonomous transport user's micro-level perspective and the Smart City macro-level perspective. This categorisation can serve as a designing tool technique and analytical framework for future researches on autonomous transport. The three dimensions, which combine the user's involvement and the technological development of autonomous transport in urban areas, are as follows: 1. The role of autonomous transport in the urban context; 2. Ethical considerations towards the development of autonomous transport; and 3. Informed and creative citizens in the Smart City context.