Case Study: Smart public transport in Helsinki Metropolitan Area

Contents

About Climate-KIC

Climate-KIC is the EU's largest public private partnership addressing climate change through innovation to build a zero carbon economy. We address climate change across four priority themes: urban areas, land use, production systems, climate metrics and finance. Education is at the heart of these themes to inspire and empower the next generation of climate leaders. We run programmes for students, start-ups and innovators across Europe via centres in major cities, convening a community of the best people and organisations. Our approach starts with improving the way people live in cities. Our focus on industry creates the products required for a better living environment, and we look to optimise land use to produce the food people need. Climate-KIC is supported by the European Institute of Innovation and Technology (EIT), a body of the European Union.

http://www.climate-kic.org

KutsuPlus

Is there a better mobility solution to the organisation of public transport to attract new users including car commuters? Professor Reijo Sulonen at Aalto University thought that his speciality in computer science could be applied to achieve just that. This case looks at this innovative pilot in urban mobility management in Finland. It analyses the successes and learning points of a technology-driven innovative public transport pilot project in Helsinki.

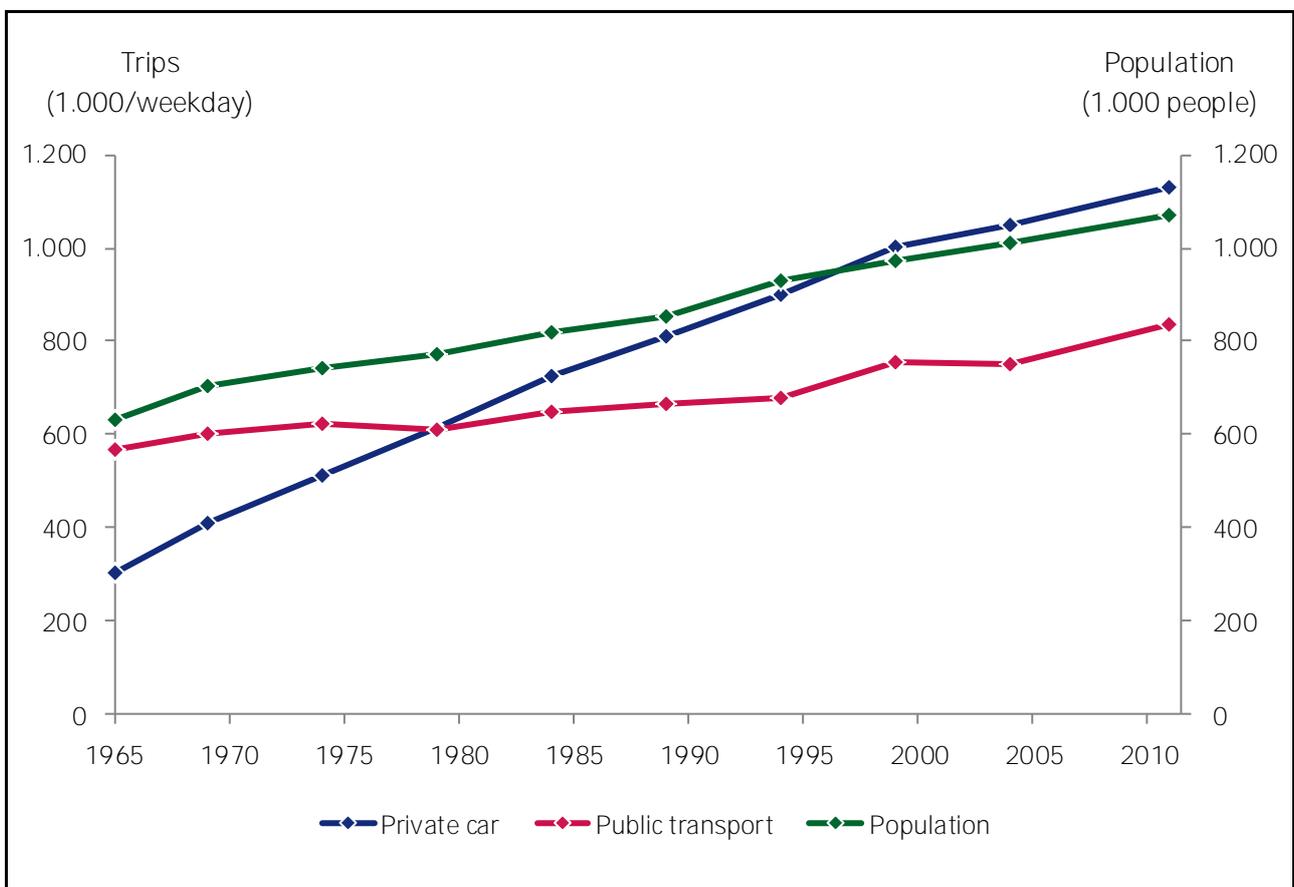## 1. Context – Travel And Transport In The Helsinki Metropolitan Area

Fig. 1 – Helsinki regional travel survey 2012 (HLJ215). Source: Kutsuplus – Final Report, 2016, p5

The Helsinki Metropolitan Area has 1.1 million inhabitants includes the cities of Helsinki, Espoo, Vantaa and Kauniainen. The region has been steadily growing and, consequently, the previous figure shows there was a significant volume of commuting traffic coming from other parts of the metropolitan area and further afield into Helsinki city centre. (Lindeqvist et al. 2013). In 2012, almost two million trips were made per weekday (some 3,000 trips were made per minute), of which 1.1 million were with private cars (HLJ, 2016). Although the region has a large geographical area, there's "huge potential for combining trips in an intelligent way" the Region Transport Plan (known as 'HLJ' locally) noted. Large scale trip combining had the potential to match the effects of a congestion charge (HLJ, 2016).

Transport causes about a quarter of total greenhouse gas emissions in the Metropolitan Area with private cars accounting from some 60% (HSY 2014). Traffic exhaust fumes can have a detrimental effect in an area that is considered to have comparatively good air quality. (Malkki and Loukkola 2015.) It was recognised that new solutions were needed to radically reduce the greenhouse gas emissions caused by the transport system (Ryynänen et al. 2014) and congestion on commuter routes and city centres.

The amount of private car traffic has reduced in downtown Helsinki over the last two decades as a consequence of restrictions to street-level parking and the introduction of expensive underground parking (Granholm 2015). That said the picture varies across the metropolitan area. In Espoo and Vantaa 46% of all journeys were made by car, compared to only 29% Helsinki only 29%. In Helsinki the use of public transport is more common than in Espoo and Vantaa (34% compared to 20% and 18% respectively). (Lindeqvist et al. 2013).

The HLJ felt that Kutsu plus has the potential to grow to 3.3 million trips per weekday – some 20-23% of all journeys, making a substantial impact on the system.

2. The Original Concept

The initial concept for KutsuPlus was to devise an on-demand bus service that could take passengers from one bus stop to another without the need for transfers. The idea was that it would offer a fast and comfortable alternative to taxis and more conventional public transport, as well optimising the flexibility of the route.

Professor Sulonen entered an innovation competition securing a funding from Tekes, the Finnish Finding Agency for Innovation. A €1.3 million interdisciplinary research project was awarded late 2007. A project coordinator was hired and several public partners involving including: HKL and YTV (they later formed what is now Helsinki Region Transport, known as HSL), the Ministry of Transport and Communications and representatives the innovation fund at the City of Helsinki. Six departments from Aalto University (previously the Helsinki University of Technology and Helsinki School of Business) were also involved. This allowed the team to research the feasibility of

pilot from different angles: from a socio-economic perspective, in terms of customer needs, and in relation algorithm development (Sihvola 2010).

In 2009 partners started to put plans in place and the following year a pilot plan was prepared. This culminated in the formation of in Ajelo Ltd in December 2010 to develop the system and **commercialize their plans. The plan was informed by the University's research findings. The** partners and the new company signed agreement for the pilot the following June (2011) and four additional staff were recruited. Focus-groups and interviews were conducted to verify that demand existed for a public service providing a credible alternative for motorists in the Helsinki metropolitan area. A test service was also run, and the service was marketed as reliable, easy to use, and personal.

3. The Model

KutsuPlus was an on-demand weekday bus service offering a flexible rather than a fixed route, reducing or negating the need for transfers. It used conventional bus stops for passenger boarding and disembarkation. It offered a fast and comfortable alternative to taxis and conventional **public transport based on a system of 'route optimisation'. The vans had capacity** for up to nine passengers travelling in the same direction. They also had space for luggage, baby carriages and walkers, as well as providing free a wi-fi connection and power sockets. A digital screen displayed the estimated journey time in minutes to the next stop.

Passengers registered for the service and paid their fare beforehand. Trips could be ordered online or via a SMS message. The KutsuPlus service could only be ordered 45 minutes in advance.

The pilot phase ran on weekdays only from six a.m. to midnight. It covered most areas within the City of Helsinki and extended to Tapiola, Otaniemi and Leppävaara in Espoo. In Otaniemi, there is an important university campus, where the system was initially created.

The service was priced between regular public transport and taxis with a €3.50 fixed fare plus €0.45 per km of the direct route travelled (that is, not including diversions to pick up other passengers). The service offered a group discount of 20% for two people, 30% for three, 40% for four and 50% for five or more travelling together. Further discounts of 20% were offered on orders made between 10am and 2pm. The pricing policy was clearly designed to incentivise off-peak travel and journey sharing or group travel.

The service was initially designed for smartphone use with customers required register to get the most out of the system. Some extra effort was also required to load money into a travel wallet. The ability to order a ride without registering using an SMS was added. It should be noted that the KutsuPlus was established as a separate system not connected to the standard HSL tickets, and HSL travel cards were not valid/accepted.

4. Stakeholder Perspectives

There were three groups of principal actors involved in the KutsuPlus service:

- The delivery partners including the municipalities in the Helsinki Metropolitan Region (Helsinki, Espoo, Vantaa and Kauniainen), Helsinki Region Transport HSL, technology company Ajelo (subsequently Split Finland and recently acquired by MOIA) and universities in the region.
- The end users and potential service users i.e. regional inhabitants.
- Those offering competing services and/or with an interest in transport provision - taxi drivers and other transport service providers, and companies.

Each had their own perspective on the service, its target group and future potential.

The Delivery Partners

Building on the work initiated at Aalto University (University of Tampere & Mattersoft 2015), Ajelo Ltd developed the technology behind the KutsuPlus. The team also modified the system to meet changing service needs. The university was involved in the early phases of the service development both in terms of the initial research and during the first pilot phase. The service was planned initially to enhance mobility between campuses for staff and students alike.

Helsinki Region Transport (HSL) plans and organizes the public transport services in the region. It managed the KutsuPlus service via a KutsuPlus project group with two full-time employees and two part-time students. The program director felt that that pilot with 15 vehicles was an appropriate scale for initially testing the technology. To test the feasibility of the full-service, he felt a larger pool of least 45 vehicles would be required but was unable to secure sufficient funds for a fleet of that scale. His vision for the roll out of the project was to have numerous vehicles of different sizes including some larger vehicles operating along principal transport routes (Rissanen 2015). The projected growth was from about 70,000 rides in 2014 to over 2 million in 2018 with some 100 mini vans deployed (Kankare 2015). This would provide a sufficient critical mass, increasing the efficiency of the service and decreasing the need for public subsidy with an objective of self-sufficiency by 2020 (Rissanen 2014).
Whilst HSL perceived that the service should be for all user groups it was thought to have particular potential for people with disabilities using specially adapted vehicles.

The Helsinki Metropolitan Region municipalities financed the service and assumed responsibility for budgetary decisions. Although Helsinki perhaps benefited from the service more than other cities, it was thought generally to be a cost-effective solution during a period of economically challenging times for local authorities. It was noted that some municipal actors and potential customers felt that the pilot operated in an area well served by public transport (Ahtiainen 2015,

Granholm 2015). One stakeholder from Espoo suggested that KutsuPlus could become part of a regular taxi service deploying smaller cars for single trips or nearby taxis accepting that the fares charged may need to rise (Ahtiainen 2015).

User Profile And User Experiences

At first the KutsuPlus users were mostly comprised of students and early adopters of new technologies though this changed over time as the service became popular with other users. Businesspeople, civil servants, university staff, parents with small children liked the fact you could guarantee a space on a service (unlike conventional public transport services). Once it became possible to order KutsuPlus using SMS more senior citizens used the service (Rissanen 2015). The user profile of the KutsuPlus service is a little different from regular public transport with more male customers (especially amongst the 30 to 44 age group). Typically, 60-65% of regular public transport users are women.

A sustainable mobility research project related to children's activities was piloted on the KutsuPlus service. According to a survey of 490 families, 56% found the service a very useful or moderately useful transport mode for this purpose. That said only 4% of parents had used the service, and 79% had heard about it, but not used it (Ahonen 2016). The parents liked the safety of the KutsuPlus service and found it a good alternative for trips without a direct route on regular public transport. They, however, also felt that it was expensive to be used several times a week. The families, who tried the service, were generally happy with it.

Competing Services

Being a hybrid service, the service took some business from taxis some of whom were angry that KutsuPlus provided a too similar a service at lower price (Varmavuori, 2^w014). KutsuPlus arguably competed with tap and ride services (Uber drivers) as they also use smart technology to combine rides. It was noted that Kutisuplus drivers were paid more than drivers for other private ride-sharing companies.

1. Work in small groups of 4-6 persons and appoint a facilitator.

2. Please undertake a stakeholder analysis, mapping the most relevant stakeholders, highlighting their significance and prime interests.

3. Assume the role of one of the stakeholders identified and provide a generic and brief description of w you perceive the rationale for the service and the issues it is seeking to address.

4. Take around ten minutes to summarise the key issues or problems your character thinks need to be addressed on a post-it note. Use one problem or issue per post-it note. The more identified at this stage, the better.

5. Discussion: This is the fundamental part of the exercise. Explain the problems or issues that you have identified and start sticking the post-it notes on the wall. There is likely to be some repetition, some new problems or issues identified and varying opinions on the same topic. The facilitator will encourage a lively discussion and group reflection, not just considering the stances of individual participants. This step will result in a series of **'chaotic clouds' illustrating the problems and issues id**entified (a cloud for each key category/theme).

6. Once the problems have been discussed by theme, please identify clusters of similar issues within each and prioritize those considered to be most relevant in each category or theme.

7. Finally, your facilitator will present a summary of the principal conclusions categorized and prioritized. Please decide if they agree with the narrative or if they think that some information is missing.

5. Implementation

The first KutsuPlus pilot started on university campuses in 2012 and was rolled out to the public in 2013. The numbers of users and rides steadily grew during the pilot phase, the low fares appeared to attract users. By October 2015 there were 31,000 registered customers and 15 mini vans in service. Customer surveys suggest high user satisfaction.

KutsuPlus users were generally very happy with the service. In the most recent HSL customer satisfaction study of Helsinki Region Transport the KutsuPlus service scored 4.74 on a scale of 1 to 5 (where 5 is the highest score). The score for other public transport services is good, but not as high as that for the KutsuPlus service. (Rissanen 2015.) Customers thought the service was comfortable and fast and liked the real-time destination screens (Sjöblom 2015).

The fares rose after the initial pilot, although the average was still under €6 per ride. That said, the commensurate increase in fare income remained well under the costs of running the service.

After this initial success the service was withdrawn at the end of 2015. The Municipalities were reluctant to invest more money in this service and continue to subsidise the running costs against a backdrop of reduced public transport funding. They preferred to direct their subsidies to conventional public transport services to maintain ticket prices at an acceptable level rather supporting alternative services (Keränen 2015).

Until 2015 the service was priced at point closer to bus fares than taxi fares and of sufficiently high quality to attract car users. The price was low to attract passengers, but the high subsidy rate drew heavy criticism from taxpayers and taxi drivers (Varmavuori 2014). Ultimately the municipalities were not prepared to continue to commit to increasing subsidies for the pilot each year (Figure 5.4).
HSL negotiated with different organisations to try to continue the KutsuPlus service. The option of a private sector provider was considered accepting that the price structure of the service might have to be revised slightly, though still at a price significantly cheaper than a taxi (Jääskeläinen 2015).

The technology developed by Ajelo for 'ridesharing' was used in Washington to provide a similar service offering a more taxi-like service with smaller and privately-owned cars (Sihvola 2010). This built on the experience of moving people more efficiently using powerful algorithms that could group people in vehicles together dynamically.

Assignment 2: Strategic Niche Management

1. Please write down, individually, on a sheet of paper all the different ways the service has **been supported. Write each aspect on a separate sticky note: A green note for 'shielding', a yellow note for 'nurturing', and a pink note for 'empowering'.**

2. Work in small groups of 4-6 persons led by a facilitator. Discuss your sticky notes within the group and decide whether the aspects represent shielding, nurturing or empowering. Group sticky notes around these words on a flipchart. The group will also discuss what the regime and niche are in this instance.

3. Group Discussion: What would you suggest as the next step to enter the regime? Write your suggestions on a flipchart. Finally, what did you learn from the exercise

6. Learning Points

The former project co-ordinator for Kutsu plus felt that the service would have been better run by the private sector supported by a subsidy to launch the service (Sihvola 2010). It was noted whilst that a private-sector led service may be able to drive down drivers' wages, they face the same viability challenges of scale-up (Sulopuisto, 1016). Another observation (Sihvola 2010) was the brand was too similar to the HSL brand meaning people didn't necessarily see the difference between KutsuPlus vans and services aimed at people with restricted mobility and senior citizens (the vehicles looked very similar).

Suggested KutsuPlus budget for 2016-2018
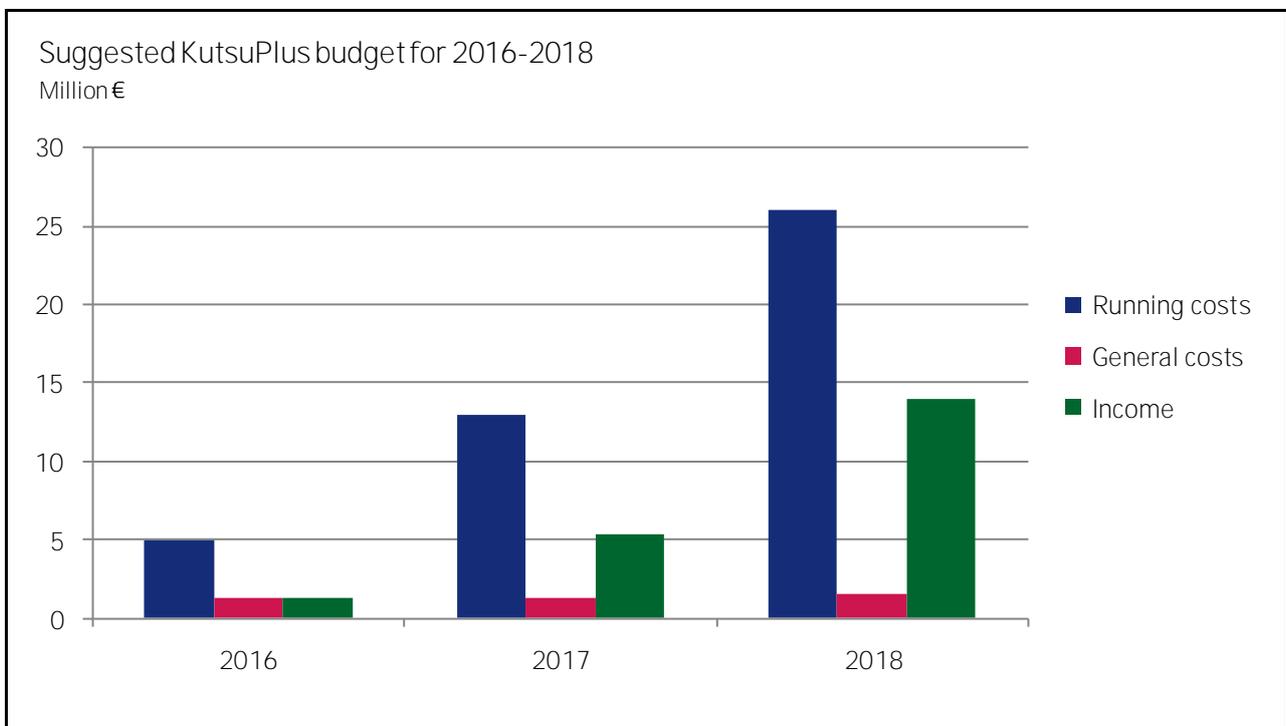
Challenges And Strengths

The challenges related to:
- The cost structure. KutsuPlus was discontinued because it would have relied continuing and increasing public subsidies in coming years. The decision to discontinue the service was based on the budget to 2018 (Ahtiainen 2015, see Figure). The project group claimed that it would have supported itself if there were more vans, but the user numbers and costs did not support this. The cost structure was such that it would have been hard to make it economically viable (Ahtiainen 2015, Granhom 2015). The early ramp-up of the service incurred high service development and marketing costs per vehicle.

- The location. After initially thinking that transport improvements between university campuses would be a good idea (it was also a municipal strategic priority) it was decided that this was not the right location. The pilot also did not extend to the northern parts of the metropolitan area, where it might have been more useful.

- Integration with mainstream public transport services: Full service integration was not achieved. For instance, regular users of the public transport typically had monthly tickets loaded on their travel cards and Kutsu plus was not a redeemable service. The incentive for current users was therefore inhibited by the fact that a KutsuPlus ride would incur additional cost.

- The situation. It is possible that the idea created in Finland suited better areas with more people and a lower levels of public transport provision.

- Service flexibility. The short notice required to order the service was a barrier for some customers and it was not always available at busy times. The actual user technology was rudimentary and there was no mobile app available.

The strengths were as follows:
- Flexibility. The Ministry of Transport and Communication were very flexible, and during the project development phase accepted that there was no need to be inhibited by existing legislation because it was a pilot project.

- Vision. This and the vision that HSL and the municipalities had on the potential of this system to change urban mobility, helped inform the development work (Sihvola 2010).

- The application of Smart Technologies. The use of algorithms for mobility applications is spreading geographically (in Washington). The university used a simulator to project the potential demand and size of fleet.

- Alternative So lution. This novel mode of public transport turned out to be a competitive **alternative to the private car and the leased car. HSY (2016) noted that "the new service was** to become an increasingly flexible and personal form of public transport, enabling door-todoor guided journeys, while competing with the private car in terms of time usage, ecology, **and economy".**

- Environmental Benefits. A shared ride has fewer vehicle kilometres per passenger than a non-**shared ride. "When compared with a non**-shared ride, a shared ride reduces emissions, traffic accidents, congestion, wasted time for citizens, investments in and maintenance of the road network, use of land for parking space and multi-lane boulevards, and the subsidy level **of public transport" (Kutsuplus –** Final Report, 2016, p23).

7. Conclusions

The Kutsuplus pilot has shown that automated real-time scalable demand-responsive transport services have the potential to optimize routes and add value to vehicular efficiency (HSL 2016). In terms of technological feasibility and user feedback it was a success. Current trends suggest car sharing and demand responsive services are growing in popularity, especially among young people who do not want to a drivers' license and are more ready to use such services. The concept behind the KutsuPlus service could suit driverless cars well (Sihvola 2010).

HSL did try to find an alternative operator to continue the KutsuPlus service and hoped that the service would continue in 2016, but the municipalities were not willing to fund it and opted for a break for at least one year (Rissanen 2015). Two aspects ultimately ended Kutsuplus. The first was the large scale of the project required to make of ride-sharing economically viable. The second was the significant public cost of supporting this scale of investment. The transport authority had ambitious expansion plans from the original 15 buses, the fleet was to grow to 45 vehicles in 2016, 100 vehicles in 2017, and later several thousand vehicles. Achieving this scale of growth was crucial to optimize trips across an entire fleet. "With a small number of buses and users, it's more difficult to match up passengers who are going in the same direction around the same time" (Sulopuisto, 1016). The minibuses were meant for high-volume usage.

> **"**Rather than investing many
> millions more into Kutsuplus to bring it to scale, city officials
> backed away. They let the pilot come to an end.**"**
>
> (Sulopuisto, 1016).

Although the €3 million it cost to run Kutsuplus was less than 1% of the Transport Authority's budget, the service was heavily subsidized and the €17 per-trip cost to taxpayers proved controversial (Sulopuisto, 1016).

As for the future, HSL will use the results of the pilot in its own work and look at the possibility of implementing a market-driven Kutsuplus service in the future (HSL, 2016).

Assignment 3: Identifying Barriers And Structures That Resist Change

1. Work in small groups of 4-6 persons led by a facilitator.

2. Define the regime is in this instance.

3. Identify barriers that hinder changes within system and features that inhibit change.

4. Categorise these into technological, social, cultural, political, economic or institutional barriers.

5. Write these barriers and inhibiting structures on a flipchart and present your work.

6. Please discuss: How would it be possible to overcome these barriers or change the structures?

Assignment 4: Exploring and building on user perspectives

1. Please work in small groups of 4-6 persons led by a facilitator.

2. In small groups study the material given on the user experiences and barriers of the KutsuPlus service (based on the sections 4 and 5).

3. **"Technology actors usually focus on developing, testing and optimising technology, but neglect embedding in the broader society" (Schot & Geels 2008). Do you think this** argument applies in this case? Please substantiate your thoughts with information from the text.

4. Design a KutsuPlus service from a user perspective: How would you proceed? Write your plan on a flipchart and prepare to present.

5. Each group presents their plan.

6. A facilitated discussion follows lead by guiding questions such as:

   a. What are the potential problems with a technology-driven approach?

   b. Why does the technology company think they considered the user perspectives, but some other actors seem not to agree with this view?

   c. What could be done to include user perspectives and how? What would be costs and benefits of these measures?

   d. Is a technological innovation enough or is some kind of a social innovation always needed?

Imprint

Author info:

Kati Berninger (Ph.D.) is an experienced and international environmental professional. She has written several books on climate and sustainability issues. She is a partner and Research Director at Tyrsky Consulting Ltd.

Gunnar Glänzel (MBA, Dipl.-Soz.) is a freelance researcher with an academic background in social innovation, social entrepreneurship, and social investment. He works for Climate-KIC's Professional Education in several functions.