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Designing cooperative I2V services for the climate-conscious stakeholder group – options to reach the next opinion leaders?

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Abstract
How can targeting co-operative I2V services to the so called climate-conscious urban mobility avant-garde contribute to broadening the co-operative systems user base? Service idea is to support drivers in their practice of greener decision making in those cases where they feel they need to ride a car. By driving individualization of cooperative services to the extreme, current feasibility limits for road operators and TCCs are sounded-out. At the same time the enhanced deployment potential is unveiled when piggy-packing context-specific service ideas onto mainstream cooperative services. Ultimately all convenience and service quality ambition comes down to a kind of co-operative services-enabled climate alarm-clock. The idea is to reduce mobility-related distress peak levels – typically from traffic jams and from challenging weather conditions. The service bundle also includes real-time co-modal routing recommendations on more efficient start times for specific journeys as well as alternative routing. This all may soon become available on Smartphone apps optimized for car drivers in urban traffic contexts. Reducing distress fosters feedback-enhanced learning and helps to better cope with severe weather situations. More generally speaking we investigate how the I2V co-operative services concept can be used for communication to pioneering climate-conscious citizens and therefore better prepare the next generation-opinion leaders.

Keywords:
Co-operative services; I2V; co-modal routing; green urban mobility; low-carbon mobility; environmental-conscious mobility, key-individuals; national innovation system; ITS deployment; piggy-packing; impact assessment; FESTA-methodology.

Introduction

This paper investigates some strategic options for selectively broadening the user base for cooperative services. Rationale for this selective strategy is to target opinion leaders for next generation traffic management approaches in metropolitan areas (here Vienna, Austria). Infrastructure-based routing by means of individualized services for environmentally conscious citizens might feel as a marginally relevant idea at first sight. However when seen from the perspective of what we know about any process of diffusion of innovation (Rogers, 1995) this could contribute to quickly address those situations and users where a service's convincing differential advantage leads to high technology acceptance, high satisfaction and helps to establish a unique communication channel towards next-generation opinion leaders. First we introduce some of the unique context and background factors because this is actually a kind of second generation cooperative services, where technical results, features and functions from first generation services are significantly enhanced and optimized for the needs of one specific stakeholder group. We then present the service bundle idea and discuss risks and opportunities from the perspective of a pioneering national road operator.

Institutional and organizational context

Austria has had an excellent institutional context for deploying co-operative I2V services:

- In January 2012 Vienna was ranked number one of the smartest cities globally (http://www.fastcoexist.com/1679127/the-top-10-smart-cities-on-the-planet). "Vienna was the only city that ranked in the top 10 in every category: innovation city (5), regional green city (4), quality of life (1) and digital governance (8). Vienna is establishing bold smart-city targets and tracking their progress to reach them, with programs like the Smart Energy Vision 2050, Roadmap 2020, and Action Plan 2012-2015. Vienna's planners use stakeholder consultation processes into building and executing carbon reduction, in the hopes of making the city a major European player in smart city technologies."
- ASFiNAG, Austria's nation-wide high-level road operator, has committed to bringing quality information to its road network users. To this end ASFiNAG has entered cooperation with several traffic-information service providers (ÖAMTC, ORF, ITS-Vienna Region, TW1, ÖBB etc.).
- ASFiNAG has proactively served in key coordinating functions for travel information projects and preparatory activities (nation-wide harmonization of map layers, ITS service architecture, co-modal traffic information system).
- Publicly owned ASFiNAG has pioneered in deploying EC's ITS-directive and national

ITS action plan [4] [5] and has taken a very active leadership function in EASYWAY.

- The fact that ITS World Conference 2012 takes place in Vienna, certainly has fuelled additional public and industry funding for innovative ITS-services and the national flagship FOT for cooperative services 'Testfeld Telematik'.
- In 'Testfeld Telematik' an EASYWAY compliant bundle of I2V cooperative services is tested and first results will be presented at ITS World Conference in October 2012.
- A nation-wide co-modal travel information service (project consortium VAO) has also committed to making an entirely new prototype for co-modal routing available prior to ITS World Conference in October 2012.
- Interoperability has been a key element with all nationally co-funded ITS project. Therefore actually all components for providing innovative services are present.

A service bundle for environmentally conscious urban mobility

In March 2011 the FOT Testfeld Telematik introduced a first set of cooperative services information - based on what is typically available on roadside overhead displays (speed limits, event warnings, etc). Given the highly dynamic competitive environment, a task-force has investigated strategic risks and opportunities from piggy-packing an individualized routing service bundle onto this first set of cooperative services. The service bundle would include:

- A kind of co-operative services-enabled climate alarm-clock. The idea is to reduce mobility-related distress peak levels – typically from traffic jams and from challenging weather conditions. It might even wake users up earlier in the morning.
- Real-time co-modal routing recommendations on more efficient start times for specific journeys.
- Real-time co-modal routing recommendations on more alternative routes.

All this would be optimized for in-car-use including dynamic updating from infrastructure traffic information in order to strategically serve those users who are interested in quality information.

Technically cooperative I2V services' potential to reduce climate-relevant emissions was investigated by Pucher et al. in EC's flagship cooperative services project COOPERS[3]. Some first results on climate-impacts are presented in (17). However in order to quickly have a satisfied user base at least two additional ingredients should be brought on board: First element is successfully addressing the dynamically evolving expectations of climate conscious avant-garde. Second probably is to come up with a validated service level or quality claim. Climate-relevant impacts come from bringing the potential down to the bottom-line. This involves mobility behavior as well as challenging individualization targets.

Lessons learnt from studying successful innovation marketing

More often than not the general public and especially decision makers at policy making and High Administration levels find it hard to accept what studies of innovation and innovation adoption processes have unveiled[13], [12], [15]:

(1) What perfectly works with the gadget-loving innovators typically does not find a commercially viable market with mainstream service-oriented users.

(2) If smartphone App users do not experience an immediate tangible benefit from using a service they quickly loose interest. Therefore it is not seen sufficient to generate 'downloads' or first-time users.

The underlying conceptual challenge has been known under the metaphorical concept of crossing the chasm[14] – basically a discontinuity in user take-up and market success (as illustrated in figure 1.) The horizontal axis shows the time since introducing an innovation into the market. The vertical axis shows the number of new regular users.

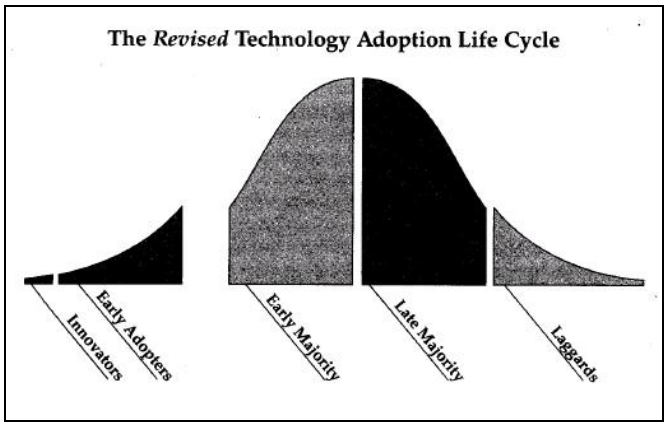

Figure 1 Crossing the chasm, Geoffrey A. Moore [13]

One option – from the perspective of successfully extending the user base for cooperative services – is to find frequent usage situations for a segment that is called early majority. All these niche-type services involve rather selective marketing. While with some service apps this seems perfectly feasible and appropriate this might turn out rather difficult for a pioneering road operator.

A first compilation of strategic risks and opportunities from introducing a climate-clock like service is shown in table 1. The authors are looking forward to discussing opportunities as well as accompanying study designs (table 2) at ITS world conference in Vienna.

Table 1: strategic risks and opportunities from introducing a climate-clock like service

	Strategic risks	Strategic opportunities
Key individuals (climate conscious avant-garde)	• Difficult to generate valid individualized routing and time of departure recommendations for large numbers of users (esp. due to network-type behavioral effects)	• High propensity of users having realistic expectations and compliance levels • Regular usage >> satisfaction • Real differential advantage • Not safety critical therefore quick roll-out via GSM
Regular Smartphone app **users**	• Without adequately adhering to an educated mobility life style less climate conscious users might unduly expect faster routing and therefore experience frustration	• Service availability could be promoted to climate-conscious road users exclusively • Emerging climate conscious followers could quickly copy avant-garde behavior
Policy layer	• Not all transport administration sees niche ITS as a priority over road construction • Risk of disturbing expectations from policy and high administration (one service for all)	• Opportunity to offer climate-conscious administration an instrument for immediate bottom-line results
Mass-media	• Risk that a road-operator driven climate-conscious initiative is made fun of • Risk of being misunderstood (wrong focus on climate-related ITS instead of safety-related road construction and maintenance)	• Opportunity to build a service provider image of societal responsibility

We suggest an accompanying innovation study is needed in order to truly validate the service concept and to better understand the dynamically evolving climate-conscious avant-garde's mobility life style. As an outcome of preparatory work with traffic researchers, traffic sociologists and innovation sociologists we present one possible study design in table 2:

Table 2: study design to quantify behavioral impacts from a climate-clock like service

	Individual perception (acceptance, usability, satisfaction, meaning of environmentally-conscious urban mobility)	**Objective behavior change**
Key individuals (avant-garde)	• 10 focus groups • 100 interviews • Pop-up window in Smartphone app after each journey • web-based self-administered questionnaire	• longitudinal analysis of mobility behavior (several trips per key individual are analyzed and fuel input to interviews and focus groups • sample of cross-section (comparison of travel times as compared to data from mobile phone networks)
Regular Smartphone app **users**	• 1 focus group • 20 interviews • Pop-up window in Smartphone app after each journey • web-based self-administered questionnaire	• sample of cross-section (comparison of travel times as compared to data from mobile phone networks)
Validation of **service quality** (recommended routing and travel time)	• Perceived quality and satisfaction (perceived usefulness, ease of use)	• comparison of travel times as compared to data from mobile phone networks
Impact on Vienna **metropolitan traffic system**		• System efficiency calculated from model-based simulation for Vienna metropolitan area

The validation study design in table 2 builds on bringing together individual, meso and macro levels where climate-relevant impact from cooperative services is generated. Traffic researchers will find the simulation-based study of system efficiency impact for the Vienna metro-

politan traffic system most relevant. One key element before introducing such a service into the market is: telecom operators and service operators will request the close validation of service quality levels from recommended routing and travel times (the heart of a climate-clock-type service). Study elements presented in row one in the table above probably are of key interest to users from the climate-conscious avant-garde. However the design presented in row number two is intended to study and reduce potential misunderstandings with so called regular road users. We anticipate that discussion will quickly raise the question how this fits to the role of a road operator. There is room for fine-tuning as well as for more fundamental feedback and contributions during the session at ITS 2012.

Conclusions

Starting question for our study has been "How can targeting co-operative I2V services to the so called climate-conscious urban mobility avant-garde contribute to broadening co-operative systems user base?" For some readers this might sound like prematurely taking two deployment steps at once. It remains to be seen, how such a service could possibly be deployed selectively enough in order to generate the market impact, satisfy users and at the same time avoid the hassle involved from adopting marketing practices from successful innovation champions outside the field of road operator industry.

However the field of innovative Smartphone apps cannot be controlled or limited to the absorptive capacity of typical road operators [(10)]. Given the relatively low cost in studying the underlying avant-garde user base and as these services are not safety-critical we anticipate that some pioneering service providers will be quick in implementing this or similar ideas. From a road operator's perspective, driving or guiding rationale will most probably be the opportunity to establish a communication channel to this newly emerging community of climate-conscious citizens.

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