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Developing the ‘Service’ in Mobility as a Service: experiences from a field trial of an innovative travel brokerage

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Abstract

This paper presents some of the findings from the trial and evaluation of an example of Mobility-as-a-Service (MaaS). The service, UbiGo, was developed within the Go:Smart project in Gothenburg, Sweden. In total 195 individuals in 83 households became paying customers over a period of six months. Overall, outcome of the trial was positive, i.e. the service was used and the customers were satisfied, more so than with their previous travel solution. Based on questionnaires and interviews, key service attributes were identified, including the ‘transportation smorgasbord’ concept, simplicity, improved access and flexibility, convenience, and economy. It is argued that successful implementation of MaaS requires careful consideration of these design attributes. However, MaaS relies on cooperation and collaboration, on the notion of a co-operative and interconnected transport system (including services, infrastructure, information, and payment), where boundaries between not only transport modes are blurred but also between public and private operators. The evaluation of UbiGo indicated that the main obstacles to further dissemination of MaaS may be found within and between service providing companies and organisations in terms of, e.g. regulations and institutional barriers.

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1. Introduction

With the continued global trend of urbanization and increasing demand for transportation with related issues including emissions, noise, and congestion, urban mobility is a major challenge for the future. In order to address the challenge it is necessary to improve the conditions for sustainable travel through development of vehicle technology and infrastructure but also changes in people's travel behaviour are necessary in order to reduce private car dependency and the share of trips made with fossil-fuelled vehicles (e.g., Graham-Rowe et al., 2011).

Several types of interventions have been implemented to encourage individuals to shift their travel behaviour, primarily from driving their private car to more sustainable alternatives including public transport (PT). One type of intervention targets psychological factors, or tries to motivate people through rewards and punishments. Examples include (i) economic disincentives for car use, including congestion charges, taxes and parking fees (e.g., Jakobsson et al., 2002; Washbrook et al., 2006; Börjesson et al., 2012), (ii) information campaigns and advertising to increase awareness of the effects of, and alternatives to car use (e.g. Cairns et al., 2004; Fujii and Taniguchi, 2003) and (iii) encouraging interventions such as giving away free bus passes (e.g., Fujii and Kitamura, 2003), often combined with information to increase the success rate. A different approach involves making structural changes to the transport system in order to increase the availability and quality of alternative transport options (cf. Steg and Vlek, 2009), such as the introduction of car sharing schemes (e.g. Katzev, 2003) and multimodal solutions.

Most recently, the concept described as Mobility as a Service or MaaS, i.e. "a mobility distribution model in which a customer's major transportation needs are met over one interface and are offered by a service provider" (Hietanen, 2014) has been proposed as a feasible way forward. One example of such a service is UbiGo, developed and evaluated within Go:Smart (<http://closer.lindholmen.se/en/about-closer/gosmart>), a triple helix project in Gothenburg, Sweden, involving service users, transport service providers, ICT service developers, research institutes, and society represented by Gothenburg city and the region. The intention of the project was to test and evaluate if the new service concept for more sustainable urban transport met the users' needs and requirements, i.e. if the service was used, if the users were satisfied and if they, as customers, were willing to pay for the service.

This paper presents some of the findings from the trial and evaluation of the UbiGo service and lessons learned.

2. The UbiGo service

The UbiGo service attempted to bridge the gap between private and public transport by taking on the role of a commercial actor, "a broker of everyday travel", offering customized transport services to fit the individual traveller's needs and requirements. It did this by uniting already existing transport solutions and transport providers, including public transport, taxi, car- and bike sharing, as well as rental cars, and offering them in a package to customers through a single subscription service.

The intended audience for the service was urban households, who were judged to have sufficient access to the existing transport solutions, in particular to car sharing and public transport (PT), and large enough travel needs for the service to be financially competitive with their current solution.

The UbiGo service offered access to the range of travel services through a web-interface adapted to smartphones ('the app'). Customers, in the form of households (comprised of any number of individuals including both adults and children but typically a family), paid a monthly subscription adapted to their transport needs which included a personalized combination of, and amounts of credit for, the different travel services. Credit could be topped up or rolled over, and the subscription could be modified on a monthly basis.

To access their travel services, the UbiGo traveller logged into the app where they could activate tickets/trips, make/check bookings, and access already activated tickets (e.g. for validation purposes). The app also allowed them to check their balance, bonus, and trip history, as well as get support (in terms of FAQ/customer service).

UbiGo also included a customer service phone line open 24 hours per day; and an "improved" travel guarantee, where UbiGo would cover the cost and deal with the paperwork to reclaim the extra expenditure from for instance the PT provider. Furthermore, the PT offers unique to UbiGo included daily tickets and a more generous zone system with easy up- and downgrades via the app.

The transport broker handled everything so as to create a "seamless" customer experience. The broker procured transport from different transport service providers (the local PT authority, one taxi company, one car rental company,

one car sharing company, and one bike sharing company), partly by becoming a “business client”. By representing a large number of customers, the broker could often negotiate lower prices for the individual trips. A back-office function handled administration and invoicing, and kept track of credit that was added or rolled over, extra fees from rental cars and car sharing, subscription changes, rebates, et cetera.

3. Methodology

The travel broker service was tested in a six-month field operational test from November 2013 until April 2014.

3.1. The trial

The participants in the UbiGo trial were to use the new travel broker service as part of their everyday life, ad lib and with no particular requests attached (apart from responding to three waves of questionnaires). This meant for instance that they became customers who paid for access to the service. The minimum subscription level was set at 1200 SEK/month in prepaid credit per household (as of July 2014 approximately €135). In order to encourage participation, any unused credit was refunded to the participants at the end of the test. During the trial, participants were also given the possibility to set their car aside in care of the project. If they did so they were compensated economically, mainly for the loss of value to the car. All in all 20 households did this. Furthermore, the service was set up so as to function as a real up-and-running service with back-office functions including a call centre service, invoicing procedures, and so on.

3.2. The participants

Participants were recruited in several ways, using the internet, social media, and targeted marketing like phone calls, mailed flyers, and personal contacts in areas of the city where the transport infrastructure was considered suitable. The recruitment material targeted certain groups that were deemed to benefit specifically from the service provided, for example households that had a car they did not use very often, households considering whether to buy a car or not, or household already using for instance PT or car sharing and who were interested in an easier way to handle them.

Altogether 83 households and 195 individuals became UbiGo customers (see Table 1). Approximately half were men and half were women with a mean age of 38,4 ($\pm 21,7$) years. The majority of the households consisted of two (or more) adults, with or without children. According to initial data collection, a large majority of participants used the internet and apps on computers, tablets, and smartphones on a daily basis.

3.3. Data collection and procedure

Data was collected via a mixed-methods approach, comprising questionnaires, personal interviews, focus group interviews, travel diaries, as well as collection of use data, error reports and customer service issues. The basis for this paper is the data collected via questionnaires and personal interviews.

The participants were asked to fill out three web-based questionnaires; ex-ante, in-itinere, and ex-post the six-month trial period. Altogether 151 adults completed all three questionnaires. The ex-ante questionnaire concerned expectations, motivations to join and included a self-reported baseline for travel behaviour. The in-itinere questionnaire addressed the participants’ experience of all aspects of the service and included a measurement of current behaviour while the ex-ante questionnaire concerned for example changes in behaviour, attitudes, and willingness to continue using the service.

In addition, a selected number of participants were invited to personal interviews at the end of the trial. In total 14 individual interviews and three interviews with two members of the same household were carried out (i.e. 20 interview participants in total). The interviews allowed the participants to elaborate around topics addressed in the questionnaires: they were probed for more in-depth information on the reasoning behind their opinions and to explain their experiences using the service more thoroughly. The interviews lasted 60-90 minutes and were audio-recorded in full for transcription and analysis.

Table 1. Demographic data of participants ex-ante (N=164).

Demographic	Per centage of total
Main occupation	
Employed (full or part time)	80%
Student	11%
Retired	1%
Other	8%
Household type	
Single Adult, no child	13%
Multi-Adult, no child	50%
Single Adult, with child(ren)	6%
Multi-Adult, with child(ren)	31%
Gross monthly income of household (SEK)	
0 - 25,000 SEK	8%
25,001 - 40,000 SEK	28%
40,001 - 55,000 SEK	16%
55,001 - 70,000 SEK	20%
> 70,000 SEK	27%
Car ownership in household	
One car	36%
Two or more cars	12%
Household membership of carsharing scheme	31%
Bicycle ownership	81%
Member of bikesharing scheme	19%
Public transportation pass (of some kind)	88%

3.4. Analysis

The questionnaire data was summarised and statistical analyses were performed with the software IBM SPSS. Regarding the interview data, a version of contact summary forms (cf. Miles and Huberman, 1994) was used to gather the statements regarding expectations, change or non-change, and reflections regarding travel and behaviour for each interviewee. These summaries were then analysed to find patterns.

4. Findings

4.1. Use of service

The minimum limit for a UbiGo subscription was 1200 SEK/month but the average subscription was approximately 150% of this value. During the trial, participants purchased 904 car hours, but only utilized 620 of those hours. Public transport use was also overestimated with 2220 days purchased and 1920 days utilized. The bike sharing system was not available December 2014 through February 2015. In November 2014 there were 241 bike rentals for 28 active users and in March 2015 there were 80 active users but the data on the number of rentals is not available. Overall, taxi was used to a limited degree; for November through March, there was an average of 11 taxi rentals per month.

4.2. Travel behaviour

At the end of the trial, participants reported decreases in private car use and increases in alternative mode use, particularly car sharing and use of bus/tram (Table 2).

Table 2. Reported changes in choice of transport mode, ex-post (n=160)

	More seldom	As before	More often
Private car	48%	48%	4%
Bicycle sharing	16%	61%	23%
Bus/tram	4%	46%	50%
Local train	7%	75%	18%
Car sharing	6%	37%	57%
Taxi	12%	68%	20%
Walk	6%	73%	21%

The reduction in private car use turned out to be greater than anyone, even the participants themselves, had anticipated. The participants had purchased credit for approximately 30% more car hours than utilized due to an overestimation of need: *“We are very much ‘car people’. ... We had lots of car hours left [at the end of the trial]. I had prepared for a need that never materialized. We thought we had already reduced our car use to a minimum, but we sat and thought ‘so many days per month’ [when deciding the subscription level], but it didn’t turn out that way. I knew we would change our behaviour but not to such an extreme”* (IP9).

Changes in travel behaviour were reported by 64 % of the participants (ex-post). However changes were not restricted to travel mode, reported changes also concerned pre-trip planning: *I’ve planned more in advance, like when we’re going somewhere next weekend, should we take public transport or our car or car sharing?”* (IP4); trip chaining: *“One aggregated trips [with a shared car] instead of taking random, single trips as one tends to do with a [private] car, going and buying one thing, and then turning around and going back to buy something else”* (IP14), travel time and choice of route. (For a more elaborate description, see e.g., Sochor et al. 2015.)

4.3. Satisfaction

At the end of the trial, 97% of the participants wanted to continue as UbiGo customers. Of those who had reported behavioural changes, only 3% were dissatisfied with the changes. Participants also became more satisfied with their travel as the trial progressed with satisfaction rates increasing from 77% before to FOT, to 88% during, and 93% at the end of the FOT. Six months after the trial ended (and the service no longer available), satisfaction rates had dropped back to pre-trial levels (75%), although admittedly there is no control group with which to compare: *“It’s noticeable now that we’re not in [UbiGo anymore] that it’s like, well, it feels awkward to travel in the usual way.”* (IPsPL).

4.4. Attitudes

Furthermore, the participants’ attitudes towards the various travel modes changed (Table 3). Over time the participants became less positive towards private car and more positive towards alternative modes. Examples of what influenced attitude changes include (combinations of) cost, convenience/flexibility, (re)discovery of alternative modes, and personal reflection: *“I discovered that one could get to [a shopping area in the suburbs] with one transfer and I didn’t even need to park. And especially as the city [of Gothenburg] has become now, I feel like ‘Why sit in congestion and pay congestion fees and then search for a parking spot when I maybe save five minutes compared to public transport?’”* (IP9).

Table 3. Reported changes in attitude towards different modes of transport, ex-post (n=160)

	More negative	As before	More positive
Private car	23%	74%	3%
Bicycle sharing	1%	57%	42%
Bus/tram	2%	46%	52%
Local train	3%	71%	26%
Car sharing	3%	36%	61%
Taxi	6%	76%	18%
Walking	2%	82%	16%

5. Analysis

5.1. Service attributes

In some descriptions of Mobility-as-a-Service (MaaS) it can appear as though the main challenges are technical. Designing and implementing an actual service will however require a number of decisions regarding target group, marketing, price model, invoicing, support functions, etc.

A main factor behind the positive outcome of the trial was indeed the ‘transportation smorgasbord’ concept, with the majority of users’ travel needs offered in one package. Even participants who were already using car- and bike sharing appreciated the packaged concept, as it was convenient to have only one subscription, one customer support number, etc. *“The best part is the package; getting a unified solution to get by without a [private] car.”* (IP11).

The service made participants feel that they had more transportation alternatives available to them. The alternatives also became more ‘mentally’ accessible due to having to reflect on one’s travel needs in order to set one’s subscription level, as well as having to choose one’s mode for the next trip from a list in the app. This made participants consider their trip choices and travel habits to a greater extent: *“I don’t take the tram just to take the tram. I stop and think – should I bike instead? It’s not much but it means that one thinks in a different way”* (IPsRI).

Purchasing a car or a public transport pass can make people feel ‘locked in’ to choose that mode no matter what the trip conditions. Beyond the flexibility of having multiple alternatives from which to choose, participants felt they could better adapt their choice of mode to the individual trip requirements; *“It’s not about being a bus user or a walker or; it’s that you’re everything* (IP7). However, participants’ perceived need for flexibility was even greater than what the UbiGo service offered, or, participants got a taste for flexibility and then desired even more. For instance, they wanted more transport providers included in the offer, e.g. multiple taxi companies from which they could choose; and they particularly wanted their UbiGo subscription to cover all their travel needs, e.g. long-distance buses and trains, and even travel in other cities and countries.

A critical aspect for the perception of increased accessibility was distance to car sharing. Car sharing systems are not widespread in Gothenburg and potential customers were therefore targeted based on distance to these services. Indeed, car sharing sites considered too far away for practical use was one of the reasons for not becoming a UbiGo customer. (For a more elaborate description of motives and deterrents, see e.g., Sochor et al. 2014.)

Important and more specific service attributes were that several people, for instance a household, could be included in one subscription with one monthly invoice; that it was too easy to up-/downgrade public transport zones for a particular day; that the public transport tickets were daily (not otherwise on offer); and that one only had to activate the daily PT tickets only once instead of a tap-in system.

Although economy was rarely the main motive for the participants it did act as a deterrent for some who were interested but decided not to join the trial. Participants expected their UbiGo transportation expenditures to at least not be more expensive than their current solutions, although many agreed that UbiGo led to reduced travel costs. Whether or not participants saved money by using UbiGo, participants appreciated the pay-per-use concept (combined

with the ability to roll over and top up credit); partly as this made travel costs more transparent (broken down per trip/day), and partly as not having sunk costs in a particular mode meant that they could more easily choose a mode according to each trip's requirements. UbiGo's daily public transport tickets were also highly appreciated, although some lock-in effects were observed for these as well (if one had previously activated a daily ticket, one was more likely to keep using PT throughout the day); *"It became cheaper [to use public transport instead of a car]. Then it becomes convenient as well, if one has not seen that possibility before and then tries it and gets into it"* (IP12).

UbiGo was a prototype and participants had several suggestions how the service could be improved, for instance a pay-per-use system based on money rather than different forms of credit (hours of car and days of public transport). In addition, a journey planning function that provided decision support (i.e. comparisons of e.g. price, time, etc.) and that included all modes included in the service, not only PT, was considered as an important further development.

Finally, UbiGo offered a support service. Face-to-face meetings were arranged in order to help new customers define their initial subscription and during the trial, a telephone service was available 24/7. This was considered important to customers who had problems using the app, booking rental cars, comparing different alternatives, etc. For a majority of the participants becoming a UbiGo customer involved changes and, as identified by Strömberg et al. (2015), the bigger the step to take, the more support is needed.

5.2. Barriers

Even though the satisfaction of UbiGo customers indicated a potential market for the service, the end of the trial was also the end of the UbiGo service. Understanding the possible reasons behind this outcome is as important as analysing the factors behind the positive results of the trial.

One evident factor was lack of financial support. Developing UbiGo from a prototype to a fully operational, professional service with a well functioning back-office would have required more resources. A company was indeed formed and economic means were sought but the necessary financial funding was lacking at the end of the trial period. Neither the stakeholders involved, nor governmental financial bodies were willing, or had the possibility, to support further development of the service, not because that they thought that it was a non-feasible idea but because of other, primarily institutional, barriers.

Another fundamental factor was related to regulatory issues. Public transport (PT) was the backbone of the UbiGo service. In Sweden PT is subsidised by taxes, which meant that the MaaS brokerage would also be subsidised by taxes. As UbiGo during the trial was non-profit driven, the PT organisation could join the scope, but to continue as a service provider in a regular business context was not possible given present laws and regulations.

Furthermore, becoming a service provider to a commercial UbiGo meant becoming involved in a business relationship of which no one had any previous experience, neither public nor commercial actors. It is possible, even probable, that the respective businesses involved were not (yet) ready for the MaaS concept and felt uncertain about what MaaS could lead to in the long run. For instance, becoming a service provider to UbiGo, modifications to existing models including pricing etc. would have been desired but a partnership could also imply a change of identity for the company, a new type of customer relationship, etc.

Fundamentally though, albeit the underlying intention was always to create a sustainable business, UbiGo was probably considered 'a project' by most stakeholders involved, and a project has a beginning and an end. In retrospect it can be argued that the project partners did not manage to (in time) develop a strategy for how to carry the project to a next level, in this case how to deal with a successful outcome. This is an issue to have in mind, not only in the case of the UbiGo trial but all projects that involve development and testing of new innovative ideas and concepts.

6. Concluding remarks

According to Steg and Vlek (2009) changes in the availability, and actual costs and benefits of behavioural alternatives may be necessary to increase the individual's opportunities to act in a more pro-environmental way. The results of the trial demonstrate the potential of introducing of new and innovative measures e.g. MaaS and hereby fundamentally changing the transport 'offer' and the relevance of so called hard measures. Such hard measures must however be designed with consideration to the travellers' needs and requirements. Merely introducing an app, or

multimodal information or integrated payment solutions will not suffice in order to develop a successful MaaS. The case of UbiGo shows that the ‘service of the service’ must be developed too.

Furthermore, in discussions on dissemination of innovations (cf. Rogers, 1995), focus is most often on users (or customers) and possible barriers for their uptake of, for instance new products and services. Based on the findings from at least the UbiGo trial, users appear to embrace the idea of MaaS. Instead the main obstacles seem to be found within and between companies and organisations. MaaS relies on cooperation and collaboration, on the notion of a co-operative and interconnected transport system (including services, infrastructure, information, and payment), where boundaries between not only transport modes are blurred but also between public and private operators. Earlier research has however identified a number of barriers to successful collaboration including generic ones, such as lack of trust between actors, unequal distribution of power and resources, and differences in goals, etc. (Beyerlein et al., 2009; Vangen et al., 2014) and transport specific ones (e.g. Curtis and Low, 2012). In their report ‘Future of Urban Mobility’, van Audenhove et al. (2014) conclude that overall collaboration on mobility solutions is rare and further, that decisions “... do not sufficiently address interfaces with the private sector and what contribution it could make to the achievement of urban mobility goals”.

In sum, successful implementation of MaaS requires careful consideration of service design and attributes (service providers, price models, invoicing, support functions, etc.), it requires innovative and dedicated service providers committed to the challenge, but it is evident that also the larger political and regulatory context must also be addressed.

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