INTRODUCTION

Aging is a worldwide trend, especially in the more developed regions (United Nations, 2012), that results in various societal challenges that relate to topics such as housing, healthcare, and mobility. Increasing life expectancy, and therefore increasing use of healthcare and other facilities have resulted in financial threats that need to be dealt with.

A solution that is often advocated, is to let people live healthier and longer independently. Being mobile is a crucial factor for an independent and healthy ageing population. Inescapably, when people grow older, their mobility decreases. For example, they have to stop driving a car or cannot ride a bike anymore. As a result, independency to move freely reduces, while dependency on others grows.

Next to ageing, the western society has reached an era of urbanization. Urbanization results in the depopulation of rural areas, and facilities such as banks, medical facilities, or supermarkets, disappear due to a decreasing number of clients. As a consequence, rural areas transform from functional communities to purely residential areas (Simon, 2004). This development results in rural dwellers becoming even more dependent on mobility means to be able to continue using these facilities. Seniors mostly stay in rural areas, or move to rural areas (Kullberg, 2002), and they can become especially affected by this development. The combination of decreasing mobility and disappearing facilities can result in seniors that become homebound. Public transport is seen as an alternative to keep seniors from solitude, but access to public transport in rural areas is low compared to the city, and has been decreasing (Harms, 2008). Moreover, Jorritsma and Olde Kalter (2008) found that seniors are not a substantial group of public transport users and discounts do not have a significant effect on bus use among elderly.

So, it seems that public transport is of limited use to counter loneliness and to maintain or improve social connectedness. Demand responsive transport (DRT) is regarded as the next possible solution. Nelson et al. (2010), found that the goal of DRT systems is to increase social connectedness for people who suffer reduced mobility, whether it is from impairment, or from infrastructural reasons.

In this paper, we will focus on how DRT services aim at helping people to live independently, and what impact DRT use has on social connectedness. We will first look at a number of international demand responsive systems (DRTs) and consider how such systems are defined, what role they play in...
people’s lives and how we can interpret such systems from a socially innovative perspective.

Next, we will consider how DRT systems connect to independent living and daily activities and we will introduce Skewiel Mobiel, a test bed, which we consider to be an innovative, and very socially defined DRT service. We will interpret the results conducted from our test bed, which we obtained through semi-structured interviews with users, open interviews with drivers, and a quantitative trip analysis, spanning fourteen months. As a conclusion, we found that Skewiel Mobiel offers an experience that is very close to the experience of living life in an ordinary way. By this, Skewiel Mobiel shows what a DRT can look like if it is based on social innovation principles.

**SOCIAL INNOVATION**

Many definitions for social innovations exist. We follow Harris and Albury (2009), who propose to describe social innovation as “innovation explicitly for the social and public good”. They argue that social innovation is used for social challenges that are “neglected by traditional forms of private market provision and which have often been poorly served or unresolved by services organised by the state” (2009, p.16).

Because social innovation is based on social challenges, it is not defined by addressing and implementing new products, but by the aim to solve social challenges. This can result in very innovative services that are based on ‘old’ technology.

Christensen et al. (2006) state that catalytic innovations should be used to solve social problems. They wrote on catalytic innovations for social change and describe the problem of organizations that spend many resources on maintaining and optimizing their service for their current clients, but neglect the group of people that need basic services. Hereby, a status quo appears and innovation is not stimulated. The premise of Christensen et al. (2006) is that status-quo should be disrupted and need to disappear. As a consequence, they believe that social innovation cannot start with optimizing current processes, because that would sustain the status quo. Instead, they argue that social innovation is about more efficient solutions, instead of higher quality products. Moreover, they argue that new, disruptive solutions, “are likely to come from outside the ranks of the established players”, and that the new solution should be ‘good enough’ (Christensen et al., 2006, p.2) formulated guidelines for good catalytic innovations, which should:

- Be low-cost and simple alternatives for over-served, underserved, or ignored customers;
- Focus on the solution, rather than the organization, and it has to ‘meet a significant underserved need’. The solutions must be considered ‘good enough’ by users;
- Have a business model that is able to introduce, scale-up, replicate, and sustain the innovation.

Many DRT systems start as a transport service for specific target groups, such as elderly or disabled. However, the more mature the service becomes, the more target groups are added until it becomes an open-access service.

**DEMAND RESPONSIVE TRANSPORT SYSTEMS**

Over the last decades, many local governments, as well as third parties, have initiated new mobility services that work as DRT or flexible transit service (FTS). These small-scale services offer transport to people who cannot use regular mobility means, such as a private car or a bike. Also, it is intended for people who have no access to public transport, due to the lack of transport connections in the area (such as bus stops or train stations), or due to physical barriers that result in not being able to reach a transport connection. Many services fill the gap that disappearing public transport leaves behind and connect with it. By this, such services are intended to address the social issue of safeguarding social connectedness for this group.

Compared to regular public transport, DRT services are more effective ways of transport, because they generally do not need to have fixed schedules or fixed stops. They go when they are needed. Advanced flexible systems have more similarities with taxi-based transport and offer the same door-to-door mobility. Sloman and Hendy (2008) give an overview of various DRT services and FTS systems, such as TreinTaxi and Regiotaxi in The Netherlands, PubliCar in Switzerland, TaxiTub in France and Anruf Sammel Taxis in Germany. Moreover, they introduce a number of UK-based DRTs, but they see UK systems as less advanced systems, as they usually have fixed routes or fixed stops, whereas the mainland Europe-based services are more flexible.

Peerby (‘Peerby. Borrow the things you need from people in your neighborhood,’ n.d.) and Shareyourmeal (‘Shareyourmeal.net, what’s your neighbor cooking?’, n.d.) are good examples of social catalytic innovations. Both are sharing platforms where people can share their tools and seldom-used products (Peerby), or prepared meals (Shareyourmeal) with their neighbours. The organizations are new entrants in their respective service segments (tool renting and food delivery services) and both organizational forms are successful, but simple online communities. For Peerby, the offered products are almost by definition not brand new or very high-end, but the power of Peerby is to have a simple service that provides all kinds of products good enough for temporary activities.

Shareyourmeal is not about the highest quality meal, the most nutritious, or the fanciest possible. Shareyourmeal’s power is as a simple service that provides access to meals that are home-cooked with personal attention, and which offer a huge variety for a reasonable price in a local setting.

In this paper, we focus on the mobility services segment, and on DRT systems in particular, and we will show that in this area a lot can be learned from social innovation theory.
Most systems are run by traditional taxi firms or settled transport service providers. For instance, RegioTaxi in The Netherlands is assigned to taxi companies through competitive tenders, and TreinTaxi is run by the Dutch Railways and the Swiss PubliCar by PostBus; the national mail and passenger transport provider.

Brake, Mulley, and Nelson (2006) characterised the development of DRT systems and suggest that such systems should develop and/or have developed towards open-access services with flexible times and routes, as is illustrated in Figure 1. Considering the operator type of most DRTs, it is straightforward that DRTs are seen as derivatives of public transport systems, adjusted to demand-based services where someone can decide more specifically when to go where. However, this characterization is regarded from a rather functional viewpoint, since the focus is mainly on organizational aspects of the service to increase passenger numbers. For example, Brake et al. (2007) suggest that centralizing bookings and the implementation of ICT systems for GPS tracking are necessary, because that is how a high occupancy ratio will be obtained. Contradictorily enough, this focus shifts away from the user perspective.

In our field-research on mobility-based product-service systems, we found that the service of the traditional systems leaves room for improvement. To address social challenges, we propose it is not always necessary to make a service work more efficiently, but rather to improve the service experience of the people involved. Our preliminary findings suggest that a DRT that is set up as a social innovation and that involves multiple stakeholder groups in a rural area can be a better alternative for the user.

**DRTs in the Netherlands: the Dutch situation**

Sloman and Hendy (2008) saw Dutch DRT services as good examples of how a DRT service should be. RegioTaxi, for example, is a common and rather flexible DRT service. It could be booked in advance, has no fixed route, and no special stops. It is however possible that other passengers will be picked up during a journey. The service could be offered to indicated people, such as seniors and the impaired, and is then called WMO transport, which is a subsidized collective transport. Nelson et al. (2010) described the Dutch RegioTaxi in the Arnhem-Nijmegen area as a very popular service, which is ‘a combination of community transport, STS (Special Transport Services) and open shared-ride taxi services for non-eligible users’. They found that one third of the users travelled subsidized.

RegioTaxi had grown towards a countrywide network, defined by rules and regulations. We conducted a short study to the rules and regulations of highly responsive services such as RegioTaxi and, although it was intended for improving social connectedness, we learned that interpersonal aspects were very strictly defined. Although these services provide transportation to indicated people, the services are still run by large taxi companies and the service provision is defined by rules and regulations, that suggest resemblances with public transport services. Therefore, it is questionable whether DRTs are truly suitable to solve the needs of its users.

The service could offer two types of service. The first type is departure-oriented with priority on an arrival time within thirty minutes before and after the booked departure time. The other type is arrival-oriented for trips that have an arrival priority, for example an appointment in the hospital.

![Figure 1: Development of demand responsiveness of DRT services. Source: Brake et al. (2006)](http://de2014.uniandes.edu.co)
trips guaranteed that the client will arrive on time, but this could be half an hour early.

Regardless of the trip type, the client must be in the vehicle in less than two minutes after the arrival of the taxi, otherwise the driver is allowed to leave without the client. The driver must be recognizable as a driver. A client is not allowed to take more than one piece of hand luggage, unless it was mentioned during the reservation. Moreover, travelling with a pet is usually not allowed. Eating and drinking is prohibited and cameras could be installed to safeguard the passenger security (‘Vervoerreglement Regiotaxi Gelderland’, 2013; ‘Vervoerreglement Regiotaxi Twente’, 2009).

The success of RegioTaxi was discussed by Harms (2008). RegioTaxi is an open-access service, but he found, in contrast to Nelson et al. (2010) that the large amount of trips was WMO transport-based. As a consequence, he argued that the ability to offer satisfying mobility for seniors in rural areas, who are not impaired and therefore have no access to subsidized transport, is very limited. Therefore, Harms concluded that RegioTaxi was not able to challenge loneliness among the regular rural elderly.

We find it worrying that DRT services are intended for the transport of people, and that the driver and passenger appear to have an hierarchical driver-passenger relationship. In this case, the driver is recognisable as a driver and his task is to offer service, but at the same time he has to run the service within predefined time scales. DRTs might be developed to aim at countering social challenges, such as loneliness, but the viewpoint of most organizations seems to be more on the organizational aspect of running a profitable business and increasing passenger numbers, rather than a social viewpoint of understanding what role mobility can play in people’s lives. Many restrictions seem to have the intention to control passenger numbers, improve time efficiency and to make the service a well-oiled machine that transports as many passengers as possible with as little hassle as possible. This development is also addressed by Sloman and Hendy (2008), who underline that the function of DRTs is not only economical, but also social; for instance, in order to prevent loneliness.

Summarized, it appears that the flexibility of many DRTs is restricted with an increasing number of customers, and the service provision does not seem to relate to a deeper understanding of people. The functional and calculative way of solving problems does not result in the ideal form of transport, either for subsidized users nor regular users. We doubt, however, whether it is transportation that people need. We consider mobility not to be about the act of transportation, but as a tool that supports achieving goals, such as satisfying daily activities.

SKEWIEL MOBIEL: A SOCIAL ALTERNATIVE

If a DRT is a social innovation, social challenges would be the main driver for DRT existence. Therefore, emphasis on the people involved with the service and a good understanding of what demand means, is necessary for a DRT to be a social innovation.

In this paper we will elaborate on a test bed that we have been studying for several years: Skewiel Mobiel. Addressing social challenges drives Skewiel Mobiel, which is a highly flexible DRT with a high social impact. The service fits with catalytic DRT with social innovations, i.e. due to the character of the service provider, and because the service has started with a spartan electric vehicle, which managed to bring people where they wanted to go, it was thereby able to suit a social demand. The test bed has been monitored for over four years, both quantitatively, e.g., in terms of how many times the service was used and what locations are visited, and qualitatively, by interviewing users of the service and drivers. This offered us a deep insight into the working principles of the service, of how multiple stakeholders experience the service, and how the service impacted on the local society. With Skewiel Mobiel, the care provider aims at social aspects such as preventing loneliness and stimulating social connectedness on a very small scale within a socially coherent network. Skewiel Mobiel is based on the same social principles as DRT services, but it manages to address these principles more effectively, as will be further elaborated in this study.

QUANTITATIVE STUDY OF SKEWIEL MOBIEL

The service area

Skewiel Mobiel runs in a rural area in the northern part of The Netherlands, named Tytsjerksteradiel. See Table 1 for a compact characterization. It is serviced with one small, three-seated electric vehicle (see Figure 2), and the former electric four-seater as a back-up vehicle (see Figure 3). Volunteer drivers drive the vehicles from the same area as the passengers. In that area, facilities for daily life can be found, such as shops, supermarkets, a library, and medical facilities. Many senior dwellers have been living in this area their whole life and they do not intend to leave the area for a care home in the city, which is in line with the national trend (Kullberg, 2002).

<table>
<thead>
<tr>
<th>TYTSJERKSTRADIEL</th>
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<tr>
<td>20 x 25 kilometers</td>
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<tr>
<td>32000 inhabitants</td>
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<tr>
<td>17 villages (biggest: +/-10000 inhabitants, smallest: +/-200 inhabitants)</td>
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Table 1: Characterization of Tytsjerksteradiel
Source: Gemeente Tytsjerksteradiel (2014)
Quantitative data

The trip data for the quantitative study was derived from booking information managed by the care provider’s reception. The dataset consists of data from the period of 1st November 2012, until 20th December 2013. A total of 482 trips have been registered by a total of 67 unique users.

Most trips were return trips, which usually means that the driver waits or joins the activity until the activity is finished. Some trips were single directional, and eight trips were registered to contain more destinations. For 120 trips, the trip type has not been registered.

Destinations and destination type

The service area of Skewiel Mobiel is rather small. It spans an area of roughly 20 x 25 km. Figure 4 represents the villages in the area and the most important infrastructure. We have chosen to create visual representations of the data, as it provides insight into the high amount of short distance trips made by the service. Moreover, it can be seen that the larger amount of trips were made within or around one village in the area: Oenkerk (labelled ‘OEN’). Oenkerk is the stand for Skewiel Mobiel, the care provider is located in Oenkerk, and many clients live close to the care provider. Frequently visited villages (i.e. Gytsjerk: ‘GYT’ or Aldtsjerk: ‘ALD’) were found within a range of three kilometres around Oenkerk.

The maximum travelled trip distance during the monitoring period is approximately fifteen kilometres, which has been registered only two times. About two thirds of all trips are made within a distance of three km, which is a common cycling distance in The Netherlands. One third of all trips were inside a village and many people could perfectly walk these distances. However, the wide distribution of users consisted of people who have difficulties with walking and could not ride their bike or car anymore. In addition, the people who were able to walk within their home village used Skewiel Mobiel for the slightly longer distances to the neighbouring village.

Figure 5 shows that roughly half of all trips are shopping related. This can be either a visit to the supermarket, or to other shops. During the monitoring period, we learned that many trips consisted of more than one stop, although this was not mentioned in the booking diary. So, for example, a client can first visit the supermarket and thereafter the bakery or the butcher next door.
Next to shopping and visiting the supermarket, many clients use Skewiel Mobiel for visiting medical facilities such as the family doctor, dentist or pharmacy, or visiting the care centre for facilities, such as the restaurant, physical therapy, or for organized social activities.

Interestingly, socially oriented trips (visiting friends or family) are not often undertaken using Skewiel Mobiel. Skewiel Mobiel seems to be used generally for trips to maintain everyday life. Because the service area of Skewiel Mobiel offers many facilities in and around the village, this results in very short distances that are uncommon to public transport and other DRT services. The trip data showed that 62% of the trips took an hour or less.

Qualitative user interviews

User characterization

For the qualitative analysis, we conducted non-structured interviews with drivers, and semi-structured interviews with eight frequent users of Skewiel Mobiel. During the interviews, the interviewer and respondents were free to elaborate on pre-defined questions and answers. The respondents’ use frequency varied from monthly to weekly. The focus of all interviews was on the experience of the service.

The people that were interviewed were considered to be typical Skewiel Mobiel users. Seven of eight respondents were female; seven of eight lived alone, but independently. Seven of eight were using a wheeled walker, and what seems to characterize all people is their lack of access to a car.

Booking process

Users mentioned that they highly appreciated the service of Skewiel Mobiel during the booking process. The booking process was generally regarded as very easy and respondents appreciated the fact that a trip could be booked at the last moment.

The receptionist knows most users by name and knows the area. In addition, he is familiar with most clients and their frequent trips. Booking goes in a two-way direction. The client proposes a time and the receptionist and client discuss whether that is suitable. If someone else has already booked the service, both parties agree on another time. The reception or client estimate how long a trip will take and the booking is made.

Reasons for use

Users of Skewiel Mobiel generally have limited access to other types of transportation. Most respondents were not able to ride a bike anymore and all use a walker outside, although two also have to use a walker indoors. One respondent mentioned not being able to leave her house at all, but most users have difficulties with walking longer distances, and use Skewiel Mobiel to overcome the distance to the shop. As we also found out from the trip data, such short trips are amongst the typical trips that are made with Skewiel Mobiel. A second reason that was mentioned for the use of Skewiel Mobiel was the waiting time for the closest alternative: WMO transport. Respondents were not satisfied with the time interval in which this taxi service arrives. They appreciated that Skewiel Mobiel arrives on the agreed time, that drivers are familiar, and that drivers wait or help during an activity. One respondent did not see any advantages over mobility alternatives, but he agreed that the service is useful for others for a quick shopping run.

The above shows that users have a general appreciation for specific characteristics of Skewiel Mobiel, such as the short distances that are possible and the high reliability. Respondents were also directly asked what they appreciated about the service. Most respondents pointed out that they liked the idea of having a mobility option closely available when they need it, even if they do not need it continuously. Hence, being a back-up option can be considered a very high social value of the service.

Impact on everyday life

Respondents were also asked how they expect to be affected if Skewiel Mobiel disappeared. This question was asked to estimate the perceived impact of the service on everyday life. In general, respondents mentioned that they would use
alternatives, such as WMO taxi, or that they would reduce their outgoing trips. Delivery services were also proposed, for example for groceries or library books, but two respondents mentioned that the drawback was that they would like to see a product before buying or borrowing it.

These answers were in line with how most users use Skewiel Mobiel for daily activities. Using it certainly has an impact on their daily lives, because unavailability of this service would mean a reduction of the amount of daily activities. This suggests that Skewiel Mobiel provides a service that satisfies needs which are not provided by regular services.

Social impact for drivers
We have elaborated on the social impact for clients, but clients are not the only users of this service. The drivers, especially, are important stakeholders in the Skewiel Mobiel service, as they also benefit from the social impact. All drivers are volunteers, and they live in the same area as the clients. Most drivers are retired, but some of the drivers are unemployed for a different reason. Most drivers mentioned that they were looking for a day activity and they see Skewiel Mobiel as an ideal opportunity to be of use.

The relationship between drivers and clients is generally very good. Oftentimes, the driver accompanies the passenger during activities and acts more as a buddy, rather than as a servant. With the help of the driver, passengers are able to perform activities they cannot do alone. This is an underestimated advantage of this service; it increases social connectedness, and more classical DRT systems would not have made this possible. Skewiel Mobiel is therefore not a door-to-door service, but a door-through-door service.

The social value of Skewiel Mobiel for the drivers became clear when they mentioned being unsatisfied with the frequency of the trips. Sometimes, a low number of trips per day were booked and the drivers did not like this at all. Therefore, the service provider tried to increase the trip frequency, but from a social perspective and not from an economical perspective. As a result, the care provider made an agreement with a local mental healthcare provider to offer contracted trips between housing and activity centres.

CONCLUSION

DRTs might be considered as social innovation, because they aim at solving social challenges and primarily serve forgotten parts of society.

However, we argued that DRTs are not set-up as a social innovation. A DRT that is designed as a social innovation will be based on different principles that are less organizational and more user-centred. Therefore, its structure will look different from that of traditional DRTs.

We found that Skewiel Mobiel is a very good example of a social innovation, partly because the service was set-up by a care provider that is very well acquainted with the seniors in the area. As a result, it is not bound to a mobility business structure or biased by what a mobility service should look like, and it addresses challenges in its own way. The care provider had a good idea of what seniors needed to increase their independency and social connectedness and Skewiel Mobiel can be considered a success, not because of how well it is organized, but because of how well it connects with people’s daily lives. Two thirds of the trips are made within a range of a few kilometres of which half of the trips are even made within a range of a few 100 metres, and this is a range that is unfamiliar for traditional DRT systems.

Destinations that Skewiel Mobiel users visit are usually for simple activities to maintain everyday life. The functional goal of such situations, such as having fresh food in house, or having a new haircut, can be satisfied by delivery services and home services. Therefore, the functional incentive to leave the house is not apparent, but leaving the house is very important for independence, social connectedness, and the well-being of all people, including seniors. We found that Skewiel Mobiel stands out from other mobility services, because it provides the freedom to leave the house and lets people live life in an ordinary way. Hereby, Skewiel Mobiel reveals itself as a social and catalytic innovation, since the service explicitly focuses on the social good and serves the underestimated need of its users to continue simple, daily life activities; something that is very common for ‘ordinary’ people, but seemingly uncommon for seniors that suffer reduced mobility. Hence, the social impact of Skewiel Mobiel seems to be especially defined by the ability to limit the social impact of decreasing mobility. In other words: Skewiel Mobiel seems to be fairly well accepted, because people are motivated to continue the life they are used to. It fits very well to habits that people used to have.

On top of that, the social impact of the service does not only affect passengers. The service has an impact on the larger social network, such as the volunteer drivers. They like to be of use for others and they enjoy their role in Skewiel Mobiel. Their loyalty, shown by their dissatisfaction with a low trip frequency and a high motivation to help, shows that they appreciate how Skewiel Mobiel works as a platform that also impacts their lives.

DISCUSSION

From our continuous monitoring of the Skewiel Mobiel service, we found that planning an activity is not a problem for a lot of seniors. However, insecurity about when the activity starts seems to be very frustrating. Moreover, we found that they do not like to devote a few hours of the day to something that used to take less than an hour, just because their mobility has been reduced.

Nevertheless, deteriorating mobility is inevitable, as growing older comes with decreasing abilities, both cognitive and physical. The valuable back-up character of Skewiel Mobiel
became clear as the respondents mentioned that they plan to use Skewiel Mobiel more often if their mobility situation becomes worse. This suggests that lots of seniors do not necessarily fear deterioration itself, but the results of deterioration. So, although they have to give in on the reality of deterioration, it is straightforward that they prepare for the next alternative. In this context, the existence of services like Skewiel Mobiel, but also other DRT alternatives is crucial for seniors. However, what makes Skewiel Mobiel stand out is its flexibility and reliability, which allows the normal act of events to take around the same time as it normally does. Moreover, the company of a driver as a buddy transforms such trips into a social event. Therefore the social impact of deterioration stays limited.

For a designer, it is essential to have a thorough understanding of the social problem to design for, and familiarity with the users can let an organization be innovative in a field that they are unfamiliar with. Design of a service will then look totally different from the services they are used to designing, developing and exploiting. Moreover, we think that design does not always have to change people’s lives. Sometimes it may be better to help people retain what they are used to doing, but find it difficult to achieve now. Losing everyday life patterns, or habits, can be painful and we think Skewiel Mobiel is a success because it enables its users to retain the life that they were used to.

It has shown to be rewarding to focus on the simple activities that are sometimes closer to the surface than they appear; this can be done by using simple, but very useful, tools. Skewiel Mobiel is a simple service for simple activities, but it has a high impact because it addresses everyday life patterns. Skewiel Mobiel shows that it is not necessary to optimize numbers, to use measurable performance indicators, and to define rules and regulations to run a service as fluid as possible. Of course, there are restrictions, but the case of Skewiel Mobiel shows that design from within a social network, established for this social network, supported by a thorough understanding of people’s daily lives, and intended to maintain, can result in a very successful service that plays an important role for the entire community.

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