# Social Dependency and Mobile Autonomy – Supporting Older Adults’ Mobility with Ridesharing ICT

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## ABSTRACT

Alternative mobility modes for older adults are increasingly important for economic, ecological and social reasons. A promising option is ridesharing, defined as use of the same vehicle by two or more people traveling to a common destination. In particular, mobile computer supported ridesharing provides a promising way to enlarge older adults’ mobility choices in addition to private driving and public transportation options. In order to understand the opportunities and obstacles of ridesharing from the point of view of elderly people, we conducted an interview study in order to examining ridesharing experiences. It turns out that ‘mobile independence’ and ‘decisional autonomy’ are key issues for mobile wellbeing. This partially conflicts with common ridesharing concepts. Hence, we further analyze older adults’ strategies dealing with these conflicts and show that these strategies offer departure points for the design ridesharing solutions, which are better suited to the demands of older adults.

## Author Keywords

Dynamic Ridesharing, Elderly, Design, Ethnography, Social Experiences.

## ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

## INTRODUCTION

In 2000 about 13% of the total U.S. population were over the age of 65. By 2025, the number of older Americans will have more than doubled, so that nearly every fourth person will be over the age of 65. In Europe, China or Japan this effect will be even more dramatic, because migration is not as high as in the US. All but the most fortunate senior citizens will be confronted by an array of medical and other constraints on their mobility even as they continue to seek an active community life [17]. Many older adults drive but still face mobility barriers, or suffer from physical or medical problems [22]. Then there is a large number of elderly people who live in regions that are underserved with public transportation infrastructure [17]. Debates on providing transportation for the elderly in gerontology, transport studies, health research and urban studies do not always capture the complexity of their situations. Based on the complex and diverse mobility situation and needs of the elderly we suggest a ridesharing system that is flexible enough to address the heterogeneous contexts of older adult mobility. Ridesharing provides not only an alternative mobility infrastructure, but also includes a social network that allows personal help when needed, or can support social inclusion. Despite its great potential, ridesharing presents quite a new topic for gerontological mobility research and we know little about developing ridesharing ICT for the elderly. This provides motivation for a qualitative study on 21 older adults’ attitudes and experiences towards ridesharing in a German mixed density area consisting of rural and urban spaces.

In the following we will draw a detailed picture of the mobility situation of older adults and we will give reasons to focus on ridesharing solutions for this particular user group (section two). Then we will provide an overview of related work on ridesharing systems in HCI research (section three), followed by a discussion (section four), arguing that research about ridesharing for the elderly is under-rehearsed. After outlining the methodological framework (section five), findings will be presented. Ridesharing needs, problems and strategies for coping with challenges of older adults provide innovation seeds for design implications that will be outlined at the end (section six).
IMPROVING OLDER ADULTS’ MOBILITY WITH RIDESHARING

According to Ziegler et al. older adults’ mobility can be understood along three dimensions in gerontology, transport studies and health research of western societies [37]: (1) as quantified movements through space and time, (2) as dependent on preconditions like the available infrastructure and (3) as subordinate to individual physical mobility status. In the following we will see how these dimensions address ridesharing and how it supplements older adults’ mobility.

Measuring mobility

The first research dimension deals with counting mobility trips on a daily or weekly basis, measuring the distances the elderly cover and the transport modes they choose (e.g. [7]). Although older adults make 22% fewer trips overall after retirement, studies show that those over 65 make a greater percentage (roughly 90%) of their trips with a car than younger people do [22]. Further, older people typically have very active post-retirement lifestyles until they are 85, and take as many as 23% more non-work trips than people under 65. In particular, older adults at retirement often have much more spare time. Older adults drive often to sports clubs, make visits, go to sightseeing tours, or just go for a walk or undertake a shopping spree. Thus older adults often undertake activities along with others, and often in informal ridesharing arrangements. Studies show that about half of all trips are done in cars with at least two persons, the driver and at least one passenger [24]. In addition the percentage of trips in cars made by those over age 65 without a license is almost as high as licensed drivers. This means that informal ridesharing is already a very common and also very important transport mode among the elderly, that supports that older adults who do not drive [23].

Mobility preconditions

The second research string addresses the unequally distribution of options for older people in relation to different transport modes [17]. As the majority of older adults in western countries will increasingly live alone in suburban or rural communities, access to public infrastructure becomes increasingly problematic for this cohort. Thus the private car becomes crucial to sustain individual mobility. In addition Fokker and Grotz point out that incomplete knowledge about public transport services is a significant barrier preventing older adults from using alternative transportation modes as well [7] and explains why a good social network becomes of great importance to compensate for the absence of a car. Coughlin, for instance, discovered that older adults who are embedded in a good social network are more likely to give up driving because informal ridesharing opportunities exist [5]. In this context Lord emphasizes the adaptation of lifestyle through ‘mutual aid’ and ‘community based’ help [13]. Again others argue that such structures should be institutionalized to increase the benefits [27], [6]. One way of doing so could be a ridesharing system based on existing social networks.

Mobility and health

Existing research tends to focus on bodily or cognitive impairments in later life, causing difficulties in undertaking the basic mobility activities of daily life [3]. In particular Rosenbloom criticizes the fact that most research on older adult mobility focuses on those with the most obvious and severe disadvantages, those who do not drive or who are severely disabled [22]. She shows that disability rates have in fact been falling among all cohorts of the elderly for decades, caused by a combination of good nutrition, improved health care, better education, and higher incomes. Most elderly people, she argues, will be in overall good health until they reach age 80 or older (apart from smaller problems, like vision problems at night, problems of carrying heavy bags or coping with crowded streets) [22]. Thus, life from 60 to 80 can no longer be regarded as residual life time, but is characterized by late freedom, posing new challenges, and creating new development tasks and design options. However, driving is still the easiest physical task for older adults. Long before they lose the ability to drive, older people may be unable to board or ride public transit, or to walk to a bus stop. Thus, it is not surprising that the fear of losing the driving license is widespread among older adults [24].

In summary, ridesharing practice is a common and deeply established mode in the elderly’s daily travel. In particular, ridesharing can address the needs of those who have never had a car or a license, as well as those who have driven well into their senior years, but now are unable to do so and have poor access to public transport.

SUPPORTING RIDESHARING

Ridesharing systems became popular in the 1970s to cope with the challenge of increasing environmental awareness, oil prices and transport collapse. People at that time joined together in ridesharing communities using slip-boxes in order to exchange offers and demands [9]. Since that time ridesharing research in information systems and HCI has undergone a change in perspective, shifting from logistical concerns towards questions of social acceptance.

Matching demands and offers

The precondition for matching a driver with one or more passengers is that their mobility patterns are as congruent as possible, given travel time and route convergence. The prevalent research focus emphasizes the challenge of finding appropriate algorithms for matching rides. While there is no standard method to determine the best ride-matching method, several approaches have been developed along different foci of activity-based behavior [30], [29]. Meanwhile agile and real-time matching became key components for a successful ridesharing system. Location aware Internet-enabled mobile phones allow very short notice or even en-route notification. This constitutes the technical basis for flexibility among spatial, time, role and route dimensions [9]. Another factor for intelligent matching operations is to improve the modal choice of transport [29]. Increasingly, attention is being paid to the question how the use of online
social networks can contribute to solving problems of meeting potential sharers, coordination, and logistics [8], [15].

**Reducing transaction costs**

Reducing costs has been a major element in ridesharing research since its onset. In HCI, the focus has widened to include transaction costs. In the case of commuting, transaction costs are very low, because commutes are based on routinely established practices that do no longer need a lot of coordination work [9]. However, with the arrival of more flexible, agile ridesharing systems, handling transaction costs, becomes a much more challenging issue. For example Hansen et al. [10] focus on community based-toolkits and ICT as means to reduce transaction costs by lowering the complexity of the selection of and the navigation to meeting points. Largely in line with this perspective is the work of Xing et al. who take meeting points into consideration and call for ‘multi-modal travel planning systems’, including information about public transportation to offer optimal meeting points [36]. Several approaches, such as those presented by Brereton et al. [4] or Wash et al. [32] focus on the improvement of communication processes, comparing informal and formal systems.

**Accounting for social acceptance**

The arrival of dynamic and flexible ridesharing systems precipitated a discussion in HCI research on issues of social acceptability. Pioneering work was done by Brereton et al. [4], Allen [2], and Ozenc et al. [19], who argue that ridesharing systems can reach a wider mass of users if social challenges concerning personal preferences of commuting choice and social interaction are solved. They point out that it is necessary to understand that riding, meeting with people and participating at an event are related activities and hence a broader view of the social situation in which people travel and meet is needed. Further Ghelawat et al. [8], [4] pinpoint that agile rather than static matching programs need to arrange ridesharing based on extended social networks. Wessels et al. [33] show that online social networks provide users with the ability to share daily travel activities by publishing information using a personal profile and have the additional function of showing relationships between people. Thus, designing for participation in local social ridesharing has to deal with the question of designing networks of relations between people in order to understand how to better support ridesharing relations. Yet in using social networks systems and further using tracking and data mining technologies in combination with personal information, concerns about issues like trust, privacy and security, which are situated in social practices, are raised [16], [21], [33].

Hence, with the arrival of agile, flexible ridesharing systems, design decisions can no longer be addressed separately from concrete social and cultural perspectives. However, increasing interest in social issues like trust, privacy, safety or social interaction has not addressed ridesharing specifically. Mobility behavior is still considered as a derived demand, based on the spatial and temporal characteristics of the performed activities.

**DISCUSSION**

Economic pressure on the public sector and the low incomes of older adults create a need for developing new mobility options in the near future. Currently, supporting elderly people to use ridesharing is a blind spot in gerontology and HCI research: While gerontology articulates the challenge of supporting independent living, it has yet missed to investigate new opportunities offered by mobile and ubiquitous computing. In contrast, while transportation and mobility research gains importance in HCI research, the elderly are not thus far addressed and hence their interests are typically neglected when it comes to the design of mobile ridesharing systems. This blind spot might result from the stereotyped view that older adults are not technology savvy: a largely unwarranted assumption given that mobile phone users are getting older [17].

Further, our literature review shows that understanding older people’s mobility is mainly framed by a transportation perspective. The dominant topic is the overcoming of mobility barriers through increasing the numbers of mobility activities, providing infrastructure, and improving the health situation of older adults to enhance the ability to move from A to B in physical space. Others, however, argue that this view does not guarantee mobility without problems or an increased quality of life. For instance, authors like Ziegler et al. [37], Kaiser [11], and Steg [28], stress that we need to take subjective meanings of mobility more into consideration. In this new understanding, mobility is more than just a means to reach destinations but contributes significantly to older people’s wellbeing and quality of life. In addition, we need to consider social and cultural factors which act as barriers to choice for older adults when they examine viable means of travel [6], [23].

This new understanding implies that HCI research on ridesharing for older adults should not focus on transportation issues only. Instead we should broaden the investigation to the elderly mobility experiences, wellbeing and subjective attitudes to ridesharing. Although existing literature draws a realistic picture about older adults’ mobility activities, patterns, and transportation mode preferences, qualitative research which takes values, fears and desires into account and uncovers current mobility practices is still lacking [7]. Sensitized by the above-made arguments, the research question of how ridesharing is experienced by older adults is our primary research issue.

**METHODOLOGY**

Addressing this question we conducted an interview study. Interviews can provide detailed insights into the subjective life-worlds of individuals and therefore were chosen to investigate subjective attitudes, meanings and interpretations towards mobility in general and daily ridesharing in particular.
We chose problem-centered interviews [34] for the data collection, because they aim at focusing on experiences, perceptions and reflections in relation to specified issues. On the basis of a question guide, therefore, we asked interviewees to reflect on and expand our themes in any way they chose. The semi-structured interviews were accompanied by a short questionnaire with the function to complement the study with additional biographical and sociodemographic background information about the interviewees. The questions asked were loosely structured around a topic list about the living arrangements within daily mobility routines and the way they dovetailed (or not) with available infrastructure like possessing a car, using public transport, or other forms of mobility like ridesharing. We were further interested in mobility choices, preferences and habits.

Asking questions in a problem-centered interview provides some structure, but also provides for an open, iterative, and reflective response by both parties to the interview. Interviewers relied on reflective questioning and probing, prompting participants to provide additional detail, clarification and exemplification. Hence, we kept interviews as open as possible in order to gain individual insights in the issue of older adults’ ridesharing experiences. The interviews were conducted in participants’ homes by one of the researchers, audio-recorded and transcribed verbatim afterwards. The duration of interviews was driven by interviewees, and thus varies in length from 45 minutes to two and a half hours.

The initial contact with participants was made through various local senior organizations. We selected a heterogeneous group of seniors (N=21) in relation to gender, age, local infrastructure, and in the transport systems typically used, in order obtain a wider spectrum of ridesharing and mobility experiences. Table 1 provides an overview of the interviewees according to relevant categories. Pseudonyms are used to ensure participants’ anonymity and confidentiality.

The region that participants come from has about 100,000 inhabitants in western Germany. One characteristic of this area is that it includes both urban and very rural areas. The only public transportation option available is bus, or train (mainly for inter-city travelling). The bus service is very limited, especially in rural areas. Additionally, the landscape is very hilly and diverse; meaning that travelling from one location to another can mean very indirect journeys. Thus, the focus in this study lies on an area with limited public transport system, that is close to the real life context of most older adults.

All interviewees were still mobile and take actively part in social events and life in general. They agreed to participate on a voluntary basis and no financial compensation was offered. Further, all of the interviewees committed to collaborating in a three-year project, commencing with these initial interviews. The overall project aim is to develop a mobility platform for older adults that follows a participatory design approach [35]. Participants from the outset were aware of the research aim of building a ridesharing platform customized for older adults needs and are overall positively positioned toward mobile ridesharing solutions.

In the analyzing process we used MAXQDA software. First, interview transcripts were organized into different content parts to organize the data with the help of different code groups. Second, the data was analyzed under three leading question headings: first, what makes daily mobility actually a valuable experience; second, how is ridesharing experienced; and third, what are the strategies people use to organize their ridesharing practice? In the following we will report on our findings on these issues.

Table 1 Characteristics of interview participants (N = 21)

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<th>Category</th>
<th>Characteristics</th>
<th>Number of Respondents</th>
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<tr>
<td>Sex</td>
<td>Male</td>
<td>5 (26%)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>16 (74%)</td>
</tr>
<tr>
<td>Age</td>
<td>58-70 years</td>
<td>11 (53%)</td>
</tr>
<tr>
<td></td>
<td>70-80 years</td>
<td>10 (47%)</td>
</tr>
<tr>
<td></td>
<td>(Average: 69 years)</td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td>Married or living with a partner</td>
<td>12 (58%)</td>
</tr>
<tr>
<td></td>
<td>Widowed/Single/separated</td>
<td>9 (42%)</td>
</tr>
<tr>
<td>Housing tenure</td>
<td>Owned</td>
<td>13 (63%)</td>
</tr>
<tr>
<td></td>
<td>Rented</td>
<td>8 (37%)</td>
</tr>
<tr>
<td>Self-rated technical competence</td>
<td>More good</td>
<td>6 (26%)</td>
</tr>
<tr>
<td></td>
<td>More bad</td>
<td>15 (74%)</td>
</tr>
<tr>
<td>Population density</td>
<td>Low density</td>
<td>11 (53%)</td>
</tr>
<tr>
<td></td>
<td>High density</td>
<td>10 (47%)</td>
</tr>
<tr>
<td>Travel Modes*</td>
<td>Own car</td>
<td>17 (84%)</td>
</tr>
<tr>
<td></td>
<td>Public transportation</td>
<td>5 (21%)</td>
</tr>
<tr>
<td></td>
<td>Walking</td>
<td>8 (42%)</td>
</tr>
<tr>
<td></td>
<td>Regularly involved in Ridesharing</td>
<td>9 (47%)</td>
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* Multiple answers are possible

**FINDINGS**

Two categories turned out to be of particular significance for the experience of mobile wellbeing in older adults’ lives: independence and decisional autonomy. However, both dimensions were viewed as constraints on ridesharing arrangements, but constraints, which nevertheless could be overcome with the adoption of various strategies.

**Mobile independence and decisional autonomy**

Participants consistently raised two issues, which we call ‘mobility independence’ and ‘decisional autonomy’ in relation to their daily experiences of mobility. Every interviewee referred to at least one of the two issues, but in most cases both arguments were referred to several times. Both arguments are illustrated in the following in more detail.

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1 [http://www.maxqda.com/](http://www.maxqda.com/) (last view: 01.01.2014)
Maintaining independence from others: every participant mentioned mobility independence at least once during the interview. The following quote provides an insight into a typical answer given by one interviewee to the question of what mobility means to them:

‘It (mobility) means being very independent and able to go to places. The bus services up here are really good and I’m really happy and that is important. You don’t need anybody because the (bus) connections are excellent and you can get anywhere you like really quickly. That is very important for me. Yes, this is really very important to me’, (Mrs. Thomson, 76).

For Mrs. Thomson, who lives in a single-household in a suburban area without a car, her mobility experience is directly interwoven with her understanding of mobile independence. Hence, the mobility she mentions is concerned with the ongoing maintenance of her individual independence. Thus, by independence she means being able to manage her daily mobility by utilizing her own resources in accordance with her abilities and without depending on others. It is this understanding of independence as ‘doing things alone’ on the basis of one’s own physical and cognitive abilities that turned out to be the dominant meaning of independence. Hence, our interviewees point out that it is not just about reaching the destination but ‘managing to get there’, re-affirming their own capacity to do so. This issue of desired independence is well attested to in the gerontological literature. Plath [20], for instance, argues that the high value placed on independence can be understood against the backdrop of a society that is strongly influenced by liberal, individualist values, and is incorporated on the individual level. For older people, their status is a negotiated one. Declining physical prowess may mean that they are seen to be more dependent by others but on the basis of our evidence they are also fiercely determined to maintain independence.

Maintaining decisional autonomy: Although decisional autonomy relates to mobility independence, it is distinct from it. Quotes like following clearly express this position:

‘Yes, a great deal [mobility means] everything. Everything... the decision too, just the thought of it even I CAN go, if I want... that is so important, you know? Even if I might not actually go anywhere but just... yes, just to know that if I wanted to go anywhere, I can just go to the garage, get in my car and drive off... and yes, I am scared of the day when that might not be the case any more’, (Mrs. Martinez, 77).

Mrs. Martinez lives with her husband and two cars in a more rural area. Mobility is important for her as a means of maintaining and enhancing travel opportunities, rather than the travelling itself. In this way mobility is seen as a means of being autonomous in and through the capacity to make decisions about where, when and how to travel on one’s own. Decisional autonomy refers to the way in which older people seek to maintain and maximize their choices. This issue of autonomous decision-making is in line with the findings of Sheller [25], or Urry [31] who show that decisional and executional autonomy are key aspects of our perception of freedom and that more mobility is widely considered a symbol and facilitator of that freedom. However, many of the interviewees stated fear of an uncertainty about the future:

‘Well, err, I mean it’s always just a question of time isn’t it, how long you might still be able to drive a car. It might be over really quickly, you never know do you. It’s something I think about of course; of course not all the time, but it is an important point’, (Mrs. Harris, 75).

Mrs. Harris lives with her husband in a very rural area with two cars and demonstrates in this sequence her awareness about potentially rapid change in their mobility situation. Hence, while decisional autonomy is in general an important factor in mobile wellbeing, most participants also stated a fear of losing that autonomy in older age. Although all of the participants are still more or less satisfied with their current mobility, they also see it as endangered. Maintaining decisional autonomy ‘while one can’ seems to be tied up with making the most of current capacity in the knowledge that it may well be diminished in the future.

Independence and decisional autonomy in different transport modes

The concepts of independence and of decisional autonomy are interwoven but can be separated from each other on an analytical level. Their relative importance depends on the various transport modes being used.

Using private resources

People usually depend on a variety of resources to support mobility, including the car, bike, motorcycle or any other kind of vehicle that is appropriate for the person’s surroundings. In our case the examples deal mainly with car usage. The 80-year old Mr. Moor who resides in a very low-density location area describes the advantages of car driving like this:

Interviewer: ‘And you still drive don’t you?’
Mr. Moore: ‘Of course, I always drive by car. It means a lot because it means I’m able to get out when I want. Although the bus stop is right before our house, the bus stops only twice a day when we are lucky (smiling). You need a car in order to do all the daily errands or if you want to get out in an emergency or anything like that, or go out to the theatre’; (Mr. Moor, 80).

The car affords self-reliance in respect of both decisional autonomy and independence. In using the car, this interviewee can go to places he would not be able to reach by foot or by bus anymore. Thus, in keeping with Ziegler et al. [37] and Schwanen et al. [24], cars can function as ‘compensation tools’ to protect individual independence when physical functioning declines. Interestingly, Mr. Moor explains how he uses his ‘car driver’ capacities to occasional-
ly extend a courtesy to older adults who cannot drive and whom he picks up when he sees them on his way. Thus he refers to the widespread belief that cars are the only transport mode that can provide people with the mobility and autonomy required to live a late modern life [31], and refers to the inequalities of having a car or not. In his understanding (‘You need a car in order to do all the daily errands’) it is necessary to offer rides to those who cannot otherwise manage their errands. Multiple studies – mostly set in car-dominated societies such as the USA and Australia – point out that being able to drive in later life is strongly related with self-reliance and independence [2]. On the other hand losing the driving license raises the prospect of a dependency which most older people strongly resent and wish to avoid [1]. Thus, as Mr. Moor describes, car driving brings a responsibility with it for the others who have no car or cannot drive (any more).

Decisional autonomy connects to one’s ability to plan for oneself how to undertake journeys of whatever kind. Hence, decisional autonomy is highly connected with possessing a car. Driving means having the option of being mobile whenever one wants or needs [31]. This is in accordance with studies that examine driving cessation, where older people construct driving cessation as a loss of executional spontaneity [1]. Although decisional autonomy is also an important value for the younger ones, driving the own car can be particularly important for the older adults who more often live in low-density areas or have problems using public transportation. This is also stated in the interviews, when addressing the car as a sine qua non of mobility autonomy:

‘I’ve got to have the feeling I can get in and drive off: […] but I don’t really NEED my own car, I don’t use it every day. But I want it to be there, waiting in front of the door so it’s there when I need it’, (Mrs. Jackson, 64).

Mrs. Jackson who lives in a more urban location with good transport links sees the car as a symbolic representation of decisional autonomy. Further many participants stated that the car is the only transport mode, which allows translating immediate wishes into actions without the need for any detailed travel planning. Thus, the car is perfect for autonomous decision-making. The car allows the ‘ageing car driver’ spontaneity, independence and sense of control that cannot be replicated by other transport modes.

Using public transportation
With regard to public transportation, some interviewees also see independence in using buses, as is stated in the following:

‘my mobility... as long as I can still walk to the bus stop, use the bus, I’m happy. It’s my independence. I’d like to remain independent actually. And for me that means the bus. Not the car, because I don’t own one’, (Mrs. Martinez, 77).

Mrs. Martinez refers to the car as the transportation mode of choice but clarifies that taking the bus allows her to feel independent as well, since there is no need to ask for support. Interestingly, public services of this kind are not perceived as autonomy reducing, but as an infrastructural ‘right’- a service that are all entitled to use and - given the fact that one pays to use the service- which confers no particular sense of obligation. By and large, our interviewees had no difficulty in planning journeys in such a way that they fitted in with timetable constraints. They often reported noting or accessing information about return journeys on the back of the hand, in short notes, or by using route leaflets, so they could refer to them as needed and react more flexibly to contingencies. Thus, decisional autonomy is restricted in the case of public transportation because timetables and routes restrict the flexibility of people’s mobility. Regardless, mobility depends of course very much on people’s residential location and its traffic connections. This pertains not only to the distance to the nearest bus stop, but also the frequency of buses during different times of the day and days of the week.

Using private resources publicly: - Ridesharing
Ridesharing, by definition, entails a degree of mutual dependency. Driver and passenger depend on each other in several respects, for instance, in matching logistical concerns like time of departure, pick up places and return. Further, people have to cooperate by negotiating some agreement about the ‘intensity’ of interaction - is one expected to talk? How much? Laurier, for instance, showed that both parties have to find a way defining and negotiating their mutual relationship [12]. Further, Sherlock compares the roles of passenger and driver with the roles of being a good ‘host’ and a good ‘guest’ [26]. Thus while guest and host are background ‘politeness’ categories to driver and passenger they are resources for moral assessment of each person’s conduct during the journey. These kinds of relationship are, of course, not those found between family members or between longstanding, good friends. There, such issues are more or less settled as habitual. Hence, there does appear to be some asymmetry of decisional influence depending on these roles. The following sequence gives a good glimpse in typical statements about the ‘guest’ and ‘host’ role:

[Talking about sharing regular rides with her neighbor and going to a particular bar] ‘Of course I depend on the driver. If the driver wants to go to Xbar, drinking a coffee, I have to follow if I want or not. I don’t like the Xbar. And in return when driving on Saturday to the market I would not go to Xbar. Then people can decide whether they want to go to Xbar or drive back home with me’, (Mrs. White, 58).

There seems to be a mutual understanding that passengers as good guests have a duty to orient towards driver’s habits as Mrs. White states who lives in a single household and possess her own car and often practices ridesharing as driver and as co-driver. She explained further that she would expect to accommodate driver wishes in respect of start times for instance, and would not expect equal considera-
tion from the driver. Hence, there is a mutual understanding that passengers should make few demands on drivers largely because there is a sense of having been ‘invited’. Drivers, in short, are perceived as having more rights in negotiating the arrangements.

Further, several interviewees expressed personal issues within decisional autonomy in ridesharing situations. Since the ride opportunity is not entirely predictable with respect to time, route, etc., the potential passenger has to deal with a considerable amount of uncertainty. Relying on someone else means lining activities up with the schedule of others, at least to some extent. The following sequence illustrates an issue that was stated by participants quite often and can be seen as a result of the passengers’ loss of decisional autonomy:

‘[With ridesharing] you’ve just got to follow suit, no matter how or when she’s driving. I have to watch what anyone’s doing, I can’t look (when shopping) where I want and how long I want and what I want. Thus, I prefer to do it alone, you know [...] That’s all those things, no, well it is (on my own) more independent’, (Mrs. Williams, 73).

This respondent practices ridesharing regularly, but shows an awareness of this unequal relationship. The passenger has to adjust to the driver without even knowing what exactly s/he is adjusting to. In contrast to public transport, decisional autonomy is reduced for passengers because they are less able to plan independently. Thus, and in summary, the analysis has shown that ridesharing is characterized by participants with attitudes that fit uneasily with basic needs of mobile wellbeing: namely independence and decisional autonomy.

**Organization of ridesharing practice**

As we already mentioned above, however, ridesharing is quite popular among older adults and frequently used. This is because they adopt a range of strategies to cope with these demands that makes sharing rides a more pleasurable travel mode.

**Preserving independence**

As already mentioned above, the ‘guest’ and ‘host’ analogy in ridesharing practice, including gratitude, can cause a feeling of dependence on the driver, in contrast to using a bus, or renting a car. However, interviewees reported about a practice that can be described as ‘lift giving’ and ‘gift giving’, that can lower the experience of dependence.

‘To square things you can take some flowers or a plant to say thank you now and again. They (the drivers) don’t want anything but just to say thank you, you can get some flowers. Just a little plant. But I don’t do it so often because they don’t want you to. Like they say, it doesn’t matter whether three people are in the car or four’, (Mrs. Thomson, 64).

This woman lives in a single household directly into the city center. Although she possesses her own car, she regularly practices ridesharing with a woman who picks her up for errands and other routine chores. Giving a little gift like a flower or spending money on a coffee involves gift giving [14], and hence constitutes a form of reciprocity. Informal gift exchange economies are sometimes romanticized as being more social than the ‘cold’ value exchange economies, where one acquires a commodity or service by paying the price. However, gift exchange economies do not come for free, but involve quite complex and unspoken rules, governing timing, appropriateness and emotionality. The aforementioned roles of ‘host’ and ‘guest’ establish a particular kind of reciprocal social relationship, different in their implication from those of family member or paid service provider. The statement from Mrs. Thomson shows that people are aware of this underlying reciprocal paradigm of ridesharing and in consequence develop strategies in order to maintain their independence. Concerning this, Nicolini [18, p. 62], for instance, pointed out that ‘reciprocating a gift too soon is bound to look like a payment, therefore negating the disinterested nature of the original act and creating embarrassment; conversely, delaying the reciprocation too much is bound to be understood as ungratefulness’. Establishing reciprocity needs to be socially negotiated and is difficult to establish in such ambivalent circumstances. Given the central importance of the moral order in these arrangements, it is obvious that the relation between driver and passenger can vary across a number of dimensions. The degree to which one can impose on another will depend to extent on the degree of familiarity both parties share. Sons, for instance, have a different set of obligations towards mothers than they do towards their drinking buddies. Casual friends are very different in status from ‘good’ friends. In each instance, the kind of reciprocity that might be entailed is very different.

As already stated, there is, in some circumstances, a great reluctance to impose someone when asking for rides. In particular, the intricacies of asking relatives and friends for rides were discussed with regard to the increasing level of dependence caused by asking for a ride too often. In particular it turned out that the interviewees are very careful when family members are involved. Statements like the following are frequently found in our sample:

‘No, no, no, no, no, no! I don’t want to pester anyone if I can help it. I always see to it that I can manage by myself, if possible’, (Mrs. Gracia, 78).

Mrs. Gracia, one of the more ‘fragile’ users who lives with her daughter in a remote rural area and has no driving license, nevertheless expressed an aversion to asking family members for a lift. She further indicated that this was because she wished to avoid exploiting ‘obligations’ and preferred asking friends because some form of reciprocity was easier to negotiate. This wish not to impose is fairly consistently expressed in our sample. In sum, interviewees stated two strategies that provide some relief from the sense of dependency in ridesharing situations. This is to make use
of the principle of reciprocity and to establishing a flexible economy that can be adapted to the specific kind of relationship between driver and passenger.

Preserving decisiional autonomy
An aspect of ridesharing that is surprisingly common is that in many cases ridesharing arrangements are predicated on a common activity, such as club visits, going to the theater or cinema, or visiting friends. Ridesharing arrangements connected through a shared activity have the advantage that participants can more easily orient to the obligations entailed in an activity like shopping, club visits, going to theater or cinema or visiting friends. Hence, there are two kinds of activities that are particularly well suited for ridesharing: regular activities and spontaneous ridesharing invitations. In the first case travelling together not only enhances the experience in these circumstances, but has a pragmatic element, as well. The coordination of ridesharing within regular activities is much easier because it is based on similar, anticipated, commitments, as the following quote from Mrs. Thomson reporting about her ridesharing experiences, illustrates:

‘Well yes, they’re fixed… well, there’s a group of us who do things together… sometimes we drive to the cinema … and erm yes, then you just ask do you want to go this evening or maybe tomorrow and then one person says, yes, listen I’ll drive or [someone else says] I’ll drive… That’s what it’s like’, (Mrs. Thomson, 64).

Hence, there are some trips that are more suitable for ridesharing than others. However, in the case of regular mutual activities the activity has fixed borders. No negotiation about start and end time is necessary and there are few uncertainties caused by different interests (as long as all parties agree to limit the trip to the joint activity). Interviewees like the Mrs. Thomson report on developed routines for coordinating regular shared rides, such as meeting points and times. Thus, while single trips have to be coordinated with all parties in detail, regular ridesharing trips can be planned on a long-term basis and thus do not have negative impacts on decisional autonomy. The second kind of activity, spontaneous invitation, also has no negative consequences. Such unforeseen ride offers are valued as a win rather than a loss of decisional autonomy. In summary, constraints on decisional autonomy are reduced in ridesharing situations when certain kinds of activity are in question: Spontaneous ride offers that can provide a welcomed opportunity, or regular rides providing a long-term and routine planning opportunity.

CONCLUSION
This focus on the experiences of older adults’ mobility and ridesharing, we argue, provides new insights into the ridesharing practices of this particular user group and can inspire ridesharing design.

Elderly ridesharing practice
Although the interview study was conducted with a heterogeneous group of older adults that differ in age (from 58-80 years), gender, marital status, or population density, they all have a positive attitude towards ridesharing and think that a mobile ridesharing system would improve their mobility situation. Like the literature suggests [23] informal ridesharing is a common and frequently used travel mode. In our sample of 21 older adults about the half of the interviewees make regularly use of ridesharing, but all are experienced with this particular kind of travel mode, more or less frequently.

In our study we followed authors like Ziegler et al. [37], Kaiser [11], and Steg [28] who emphasize the need to take subjective meanings of mobility into consideration, but specifically in relation to older adults’ ridesharing experiences. One of the major observations was that although ridesharing can be a good transportation alternative either for the older adults who live in low-density areas, or have problems using public transportation, or the car, it seems not to be motivated by such issues. Hence, lacking infrastructure or a bad health condition does not primarily cause the indigence for a lift. Moreover, ridesharing takes place when people share the same destinations and particularly when undertaking joint activities. Further, findings show in accordance with the literature that mobile independence and decisional autonomy are central values for older adults’ mobility experience [13]. However, it was astonishing to see, that particularly ridesharing is problematic because of these points, but is a quite popular and common transport mode at the same time. This gives reason to search for strategies older adults use to organize their ridesharing practice.

We discovered that interviewees regularly indicated negotiated, delicate ways in which principles of reciprocity are mediated in the driver-passerenger relationship, and that this is used as a means to maintain independence in ridesharing contexts. This delicacy, contrary to the existing ridesharing literature on payment systems (which tends to the view that the main issue is providing adequate motivation for the driver [2]), suggests that a much more careful analysis of motivational elements is needed when dealing with older people. Establishing a balanced reciprocity between both parties of the driver and passenger is based on their relationship and the kind of ridesharing conducted. Further passengers are more likely to accept ride offers instead of asking for one, in order to keep their independence.

Like the desire for mobile independence, decisional autonomy, understood as flexible movement, turned out of special importance for the older adults, too. It means having the capacity to make decisions about where, when and how to travel on one’s own. This makes the car, where possible, a preferred option that allows the older driver spontaneity, independence and sense of control that cannot be replicated by other transport modes. Although ridesharing creates
some difficulties in relation to decisional autonomy, as we have seen, there are circumstances where autonomy is subordinate to other factors. Two in particular seem to outweigh this need. Firstly, spontaneous ride offers are easily accepted and secondly long-term ridesharing arrangements based on a regular and organized schedule are welcome.

Although we have no comparison with younger reference groups, there are some suggestions in the data that older adults interpret independent mobility and decisional autonomy in their own way. Hence, our interviewees point out that it is not just about reaching the destination but ‘managing to get there’, re-affirming their own capacity to do so, as long as they are able to do so. For the older adults independence and decisional autonomy are values that may be diminished in the near future, and thus, gain of importance.

**Insights on ridesharing ICT**

Our analysis demonstrates that HCI research on ridesharing for older adults should address ridesharing as a social practice rather than a transportation mode shifting people from place A to B. While ridesharing turned out to be a desirable objective in general, its practical implementation depends on a set of social issues, which relate to decisional autonomy, and to independence. These issues should be applied in ridesharing design additionally to issues discussed in literature already like trust [16], privacy [21], or security [33]. It would be naive to imagine that such insights lead directly to design decisions. Rather, we see these conclusions as aiding in the construction of the design space. That is, they point to the kinds of issue that need to be taken into account both in terms of possible constraints on design and in terms of avenues to explore. Thus and for instance, an examination of the concept of ‘independence’ and what it means for older adults has implications for the kind of payment system we might envisage. In most existing platforms, reciprocity is established exclusively via financial balancing. Among older adults, the issue of reciprocity and its concomitant obligations is nuanced, not only with respect to what payment might be negotiated as appropriate but also to when such payments might be made, if at all. As we have intimated, older people have a range of experiences in respect of their social networks, patterns of friendship and family relations. These subtle arrangements should be addressed by the design, giving the users the right to determine the kind of ridesharing conducted and what kind of reciprocity should be conducted. Beside classical paying systems, one can think for example on regular ridesharing journeys with an alternating driver where the system might remember users on the joint activity and the driver.

Further, there is a self-evident demand for mobile autonomy in our sample, but this is mediated by particular kinds of social activity with particular kinds of people. Joint activities which implicate friends and others in existing networks and which are geared to regular, repeated and routine activities are likely to be facilitated by ridesharing arrangements. Of course, to function adequately, such systems would need to provide a simple means for older people to delineate and limit who ride offers might be made to and in what circumstances. Additionally, such facilities enable participants to solve the issue of return journeys and to lower coordination effort in general, since people attend the same event and time and destination are usually tied to the event itself whilst at the same time supporting existing social networks and minimizing uncertainty. Otherwise, spontaneous ride offers can provide a welcome opportunity for traveling. In this case the design should be orientated towards easy and fast design solutions for offering rides and the design should incorporate features that help to create awareness about offers.

Lastly, ridesharing should be integrated into a pool of other mobility opportunities that do not exclusively depend on private ridesharing arrangements, but are integrated with public transport and other infrastructures that assure certain reliability. Ridesharing is of limited value to older passengers if it does not allow them to plan for contingent circumstances or changed plans. Such an integrated multi-modal platform would be of most value if it provided information not only about ridesharing opportunities but also about other modes of transport. Ridesharing, in this perspective, is one part of an enlarged mobility option that maximizes independence and decisional autonomy.

In sum, the focus on older adults’ ridesharing experiences originates in joint activities, and offers orientation, reciprocity, and multimodality as design inspirations. Findings show that matching demands, transaction costs and social acceptance should not be addressed separately, but are related to each other in and through the social practice of ridesharing and the social situation in which people travel and meet.

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