Understanding the ridesharing needs of older adults

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A B S T R A C T

Riding in the comfort of a private vehicle is the preferred mode of alternate transportation, but ridesharing services might also fit the needs of older drivers. To understand the ridesharing needs of older adults, the vehicles of 39 drivers 65 years and older were instrumented for two weeks. Post-drive interviews were conducted to understand their ridesharing challenges. A Contextual Design approach was used to assess the data from the instrumentation recordings and interview responses. Results from the Contextual Design showed that older adults faced four main challenges: limited social network, efficient communication of trip details and needs, and establishing trip reliability and privacy. These findings were used to design and build a web-based ridesharing tool prototype for older adults that addressed these challenges. Implementing such tools on current ridesharing platforms and ICTs could provide more accessible mobility options, and prolong the overall mobility and independence of older adults.

1. Introduction

Ridesharing is defined as *a transportation option in which two or more individuals who are travelling to the same destination or on route to the destination, share the cost of a ride in a taxi, bus, car, or shuttle* (Commission on Aging, 2012). Among older adults in the U.S., ridesharing is the second most important mode of transportation (Ritter et al., 2002), with 20% of 75–79 years, and 40% of 85 years and older relying on ridesharing as an alternate transportation option (AARP, 2015). Older adults with age-related decline in vision (Rubin et al., 2007), cognitive impairments (Lundberg et al., 1998), and decline in physical functioning (Marottoli et al., 1994) are known to experience a degradation of driving skills over time, and often cease driving. These older adults tend to rely on rides from friends, family, organizations, and agencies as it allows the flexibility and accessibility to get to places in the comfort of a private vehicle. The availability of ridesharing options can reduce the risk associated with prolonged unsafe driving, and help older adults maintain their access to resources through social support from family, friends, and the community. Thus ridesharing plays a crucial role in meeting the mobility needs of older adults especially in later life (Choi et al., 2012; Payyanadan et al., 2016), by allowing easy access to rides in the comfort of a private vehicle, convenience in scheduling rides, reduces the stress of driving, and provides an opportunity to socialize (Commission on Aging, 2012).

The opportunity to socialize is particularly important because social involvement helps older adults reduce their risk of declining health,

prolong their independence and mobility (de Leon et al., 2003); and a 10-year study on the out-of-home mobility of older adults showed that the ability to stay active improved their overall quality of life (Mollenkopf et al., 2017). With work trips no longer taking precedence after retirement, older adults replace work time with social and recreational activities – accounting for the largest proportion of all trips taken among those 65 years and older (Kim and Ulfarsson, 2004). But a major concern is that many of the social destinations can often only be reached by car; and under such situations, older adults cancel their social trips in the absence of alternate transportation means like ridesharing (Kim and Ulfarsson, 2004). Additionally, a survey on understanding the mobility challenges of older adults who depend on rides showed that 67% of them do not have an alternate transportation option if they cannot ride with another adult; while others either walk (18%), rely on a taxi (7%), or on special transit services (6%) as alternatives (Kostyniuk and Shope, 2003). Thus, despite the strong preference for riding with others as an alternative to driving themselves, there are a number of challenges to establishing ridesharing as a reliable transportation option for older adults.

Older adults participate in both formal and informal ridesharing. While formal ridesharing is either a private or public service that riders pay for; informal ridesharing is when drivers and passengers know each other and often belong to the same social network (Handke and Jonuschat, 2012). Review of the challenges associated with establishing ridesharing shows policy, institution, interpersonal, and intrapersonal barriers. At the state and local level, a shortage of funding represents a

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major concern for providing formal ridesharing services to older adults (Bittner et al., 2011). Current federal funding programs such as the Older Americans Act (OAA) allocates funds based on a population-based formula to provide support services for older adults (Hardin et al., 2003). Twenty percent of the 1.88 billion dollar OAA funds are allocated for Home and Community-based Services such as transportation, but require matching-funds from state and local agencies (Fox-Grage and Kathleen, 2014). Reports have shown that despite providing matching-funds, the OAA budget has increased since 2004 and so has failed to keep up with the growing aging population, which has grown by more than 55 percent from 2004 to 2014 – making it harder to support the transportation needs of the elderly who prefer to age in place (Campbell and Frech, 2016).

In addition to funding, another limitation is the reach of formal ridesharing services for the seniors in the community. A 2015 analysis on the availability of transportation service programs and public transit services showed that for 241 metropolitan areas, 15.5 million adults 65 and older had poor access (DeGood et al., 2015), and 40 percent of all rural residents in the 1,200 counties in the U.S. had no public transportation services (Research and Training Center on Disability in Rural Communities, 2017). To assist with meeting the transportation needs of these older adults, charitable and religious organizations such as the AmeriCorps, Senior Corps, Senior Companion, Wheels for Wellness, etc., use volunteer drivers to provide rides (Hardin et al., 2003). These volunteer ridesharing programs help improve the mobility and accessibility to resources for older adults by providing rides (Leistner and Steiner, 2016), but reports show that many older adults do not use these services even when available to meet all their transportation needs. While those that do not use the formal ridesharing are often unaware of these services; those who are aware often prefer to rely on their friends and family for informal rides (Silvis and Niemeier, 2009).

Limited studies conducted to understand older drivers' preference for informal and formal ridesharing have found a number of inter- and intra-personal barriers such as the limited supply of drivers, reliability and flexibility of rides, service hours and areas, frequency of services, costs, and trust when using formal ridesharing services (Peck, 2010); and reciprocity and when accepting informal rides (Silvis and Niemeier, 2009). While these studies highlight some of the important challenges to establishing ridesharing as a viable transportation alternative for older adults, there has been very little focus in translating these findings into successful solutions that can be used to improve ridesharing outcomes for older adults (Meurer et al., 2014; Shirgaokar, 2017).

With the advent of technology, there has been a major push toward the use of information communication technologies (ICTs) to deliver services such as ridesharing to the older population (Meurer et al., 2014). With 70% of older adults owning a mobile phone, 53% using the internet (Zickuhr and Madden, 2012), and the increasing use and acceptance of ICTs among older adults (Vroman et al., 2015) – there is opportunity to develop ICTs that can be customized to meet the ridesharing needs of older adults (Gustafson et al., 2015). ICTs have a number of advantages as they can serve as a unique platform for older adults to be more autonomous in managing their transportation needs by scheduling rides and paying for the service (Handke and Jonuschat, 2012). Yet ICTs are also a medium less trusted by older adults (Heinz and Kelly, 2015). Keeping these concerns in mind, the goal of this study is to a) understand the current practices and barriers to ridesharing among older adults in rural and urban settings, and b) to translate findings into a web-based ridesharing tool customized to fit the needs of older adults.

2. Method

Adults 65 years and older were recruited from urban and rural areas from a Midwestern state in the U.S. Recruitment was conducted with the help of county coordinators, and by posting flyers at the local senior centers. Participants were recruited for a period of two weeks, and their

Table 1
Demographic data (n = 39) broken down by location and gender. The age and miles driven/year categories show the group mean and standard deviation (proportion in parenthesis).

	Sample Breakdown		Age		Miles driven/year	
	Urban	Rural	Urban	Rural	Urban	Rural
Females	12 (0.31)	12 (0.31)	71.9 (5.1)	73.4 (6.2)	70.2 (19.9)	144.4 (53.2)
Males	6 (0.16)	9 (0.23)	79.5 (4.2)	77.1 (8.6)	168.2 (96.9)	242.6 (168.6)

vehicles instrumented with an in-vehicle technology suite to record their ridesharing trips. Post-drive interviews were conducted at the end of the study with each participant to understand their needs, challenges, and current practice of ridesharing. A Contextual Design approach was used to assess the ridesharing data collected from each participant along with their post-drive interview responses.

2.1. Participants

A total of 39 drivers 65 years and older were recruited from a larger study focused on improving the mobility and independence of older adults at risk of entering nursing care (Gustafson et al., 2015). To be eligible to participate in this study, inclusion criteria required that all participants hold a valid driver's license and drive their car at least twice a week. Table 1 shows the demographic data of the participants recruited from rural and urban settings.

2.2. Vehicle instrumentation

Vehicles of 39 participants were instrumented with a two-way facing camera to capture driving environment and driver-passenger behavior during each trip; audio and video recordings of each trip; an on-board diagnostic device (OBDII) for recording the GPS trace of a trip; and a black box for syncing and storing data from each of the devices (Fig. 1). Vehicles were instrumented for a period of two weeks.

2.3. Post-drive interviews

During the post-drive interview sessions, data collected from the black boxes were played back to the participants using a customized software program. Participants were asked open-ended questions about the challenges associated with sharing rides among friends, family, and members of their community, and the usefulness of developing a web-based ridesharing tool.

2.4. Contextual Design

A Contextual Design approach was implemented for understanding the ridesharing needs of older adults (Fig. 2). Contextual Design is a framework for developing front-end design such that the user data drives the overall system design and development (Beyer and Holtzblatt, 1997). The Contextual Design approach involves contextual inquiry, five work models – flow, artifacts, cultural, sequence, and physical, model consolidation, affinity diagram, visioning, storyboarding, building a user environment design, and prototyping. Such a user-centered approach is useful in assessing the existing habits, processes, and activities adopted by users, which can then be translated into a prototype that meets the users' needs.

2.5. Data collection

Video and audio recordings provided insights into the types of trips that older adults where they preferred to share rides; activities and