

Exploring Social Connectivity and Transportation Needs of the Seniors through a Mobile Smartphone Application

Center for Transportation, Environment, and Community Health
Final Report



by

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16. Abstract Mobile smartphone applications may assist seniors in their mobility and connect them with the community. This project involves the development of a new version of the Urban Connector application to: (1) identify a metric of social connectivity from the mobility perspective from existing literature; (2) update the Urban Connector application to consider data privacy policies when automatically collecting mobility data; and (3) design a survey and an analysis framework to gather information on how seniors use the Urban Connector application for social connectivity from the mobility perspective.		
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EXECUTIVE SUMMARY

Mobile smartphone applications may assist seniors in their mobility and connect them with the community. This project involves the development of a new version of Urban Connector application to: (1) identify a metric of social connectivity from the mobility perspective from existing literature; (2) update the Urban Connector application to consider data privacy policies when automatically collecting mobility data; and (3) design a survey and an analysis framework to gather information on how seniors use the Urban Connector application for social connectivity from the mobility perspective.

The first output of this research project includes a proposed *metric to measure social connectivity* of seniors from a mobility perspective. The proposed social connectivity metric uses five mobility-related indicators: (1) type of interactive event; (2) frequency of interactive event; (3), duration of interactive event; (4) quantity of interactions; and (5) quality of interactions. Each indicator is assigned one or two measures. Each measure can have a range of possible values.

The second output of this project is a *new version of the Urban Connector application* that was developed considering best practices on data privacy. This new version also enables the collection of mobility data (i.e., Travel Log) that can be used to calculate the proposed social connectivity metric. The management of data considering user's privacy is achieved through the following four considerations: (1) design the application to capture minimum amount of personal information; (2) sampling of traveling data (i.e., only one trip per day); (3) download/transfer only deidentified/anonymous data from the smartphone for analysis; and (4) identify privacy algorithms for the analysis of data collected in the Urban Connector application.

The third output of this research project is a *survey and data analysis framework to capture the mobility data* to model participant's social connectivity. The survey consists of two instruments: an in-application, daily Travel Log and an Exit Survey questionnaire. Data collected in the survey provide indicators that are part of the proposed social connectivity metric. The multinomial logit model has been proposed as the framework to relate a senior's perceived social connectivity after making a trip as a function of the senior's demographics, personal preferences and trip specific indicators.

The *outcomes* of this project contribute to understanding and awareness of senior's transportation issues as they relate to social connectivity, and increase our understanding of how technology (i.e., mobile technology) can potentially be used to address mobility issues that hinders social connectivity in seniors while considering user's privacy.

By combining the expertise of researchers in the fields of computer science, engineering, and the social and behavioral sciences, this project investigates the role mobile technologies (e.g. smartphone applications) can have to help seniors be more mobile and socially connected in their communities. The *impact* of the outcomes of this work increases the knowledge on the development of mobile technologies to support the mobility of seniors from the social connectivity perspective with privacy considerations.

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1 INTRODUCTION

1.1 Motivation

In the CTECH Project “Development of a Comprehensive Metric for Transportation, Environment, and Community Health”, physical health, mental health and social health were identified as the three criteria for community health. Under the social health criterion, alcohol-impaired driving deaths, injury deaths, public involvement have been recommended as the three indicators. These three indicators are selected because they are relatively easy to measure (Balal and Cheu, 2018, 2019). Public involvement in this context includes social connectivity with the community as a measure. To measure social connectivity from the mobility perspective is one of the objectives of this project.

The United States Census Bureau (2017), defines a senior as a person age 65 or older. Seniors face unique mobility and challenges. Six projects funded by the European Commission all found that seniors who were well connected socially had less adverse consequences on their health (Boules et al, 2009). The difficulty for seniors to freely move around or the need for specialized transportation service have the potential consequence of limiting their social connectivity and frequent interactions with immediate family members, relatives, friends, care providers. Also, the lack of mobility impacts seniors’ access to medical and social services as well as knowing social and recreational events of interest. For this segment of the population, staying connected through technology is one of the primary means for connectivity. The next level, which is to have face-to-face contact, requires transportation and sometimes specialized mobility services to bring the seniors to their desired destinations. Measuring emotional and physical connectivity through the use of technology requires the sharing and storing of personal data which are not easily accessible or are publicly unavailable.

In the past two years, researchers from The University of Texas at El Paso have developed a mobile smartphone application prototype named Urban Connector (Cheu et al., 2019; Vargas-Acosta et al., 2019; Vechione et al, 2018). The activities and accomplishments on the Urban Connector in the two years prior to this project date include:

1. Review of existing mobile smartphone applications designed for mobility (not necessarily for seniors) and for seniors (not limited to mobility) that operate on Android or iOS operating system, or both.
2. Survey to identify the mobility issues and other needs of seniors ages 55 to above 80 years. This survey was conducted with the support of the City of El Paso Parks & Recreation Department and New York University. Four hundred and fifty-eight (458) seniors from 11 Seniors Centers in El Paso, Texas and another 61 from the senior centers in New York, New York participated in the survey.
3. Design of an Android-based smartphone application prototype based on the findings of the first survey, focusing on the top functional needs of the seniors and usability for the seniors. The smartphone application was named Urban Connector.
4. Survey usability feedback of the look and feel of the prototype version of Urban Connector. The survey reached 65 participants and the research team analyzed the responses.
5. The research team used the results of the second survey to refine the Urban Connector application prototype to a version that could be used in day-to-day activities (beta) version.

6. A third survey was conducted to test the Urban Connector application to assess users' needs and concerns to make improvements and modifications to the Urban Connector application to make it more user friendly.

The Urban Connector application is designed to support the mobility of seniors in urban areas by providing useful information such as transportation options and resources. This application has the potential to promote awareness in seniors about city services and events.

1.2 Objectives

The objectives of this research are to use the Urban Connector application to: (1) investigate a metric of social connectivity from the mobility perspective from existing literature; (2) update the Urban Connector application to consider data privacy policies when automatically collecting mobility data; and (3) design a survey to gather information on how seniors use the Urban Connector application for social connectivity from the mobility perspective.

1.3 Significance

This project advanced our knowledge in quantifying senior's mobility and social connectivity with their family and community. It also advanced the knowledge on potential data privacy concerns of seniors and ways to address them. The researchers gained a basic understanding of how the Urban Connector application can be used to support the mobility of the seniors and their connectivity with the community. Results of a previous survey of seniors in El Paso (Vechione et al, 2018) showed that many seniors were unaware of the potential of smartphones (other than making basic phone call and text messaging). The Urban Connector application aims to create awareness in seniors on the features and functions that smartphones are able to provide to support their mobility and thus being able to physically and socially connect with people in their community. This project is interdisciplinary since it involves faculty and students from Civil Engineering, Computer Science and Social Sciences (Anthropology and Social Work) and thus also trained students with the skills needed to collaborate across disciplines.

1.4 Outline of Report

This report is outlined as follows. After this Introduction, Chapter 2 presents the research work plan. Chapter 3 reviews social connectivity and proposes a metric to measure social connectivity for the seniors from the mobility perspective. Chapter 4 presents the updated version of Urban Connector application that has been designed to address data privacy concerns. Chapter 5 presents survey that has been designed to capture the data necessary to analyze the social connectivity using the metric established in Chapter 3. This Chapter includes the survey instruments, survey protocol and a framework for data analysis. Chapter 6 summarizes the findings and proposes directions for continuing works.

2 RESEARCH WORK PLAN

This chapter describes the work performed to meet the objectives of this project. The work plan for this research consisted of the following three tasks:

Task 1 – Identify a social connectivity metric

The purpose of this task was to identify a metric of social connectivity from the mobility perspective from existing literature. The team conducted literature review on social connectivity from the mobility perspective, identify the existing indicators and measures, and adopted them into a metric that could be calculated using the Urban Connector application data.

Task 2 – Refine the Urban Connector application

The purpose of this task was to update the Urban Connector application to consider data privacy policies when collecting social connectivity data and trip data. The research team (i) investigated potential privacy issues derived from the use of the current version of the Urban Connector, and (ii) refined the Urban Connector application available in the Android and iOS platforms to find a balance between addressing potential privacy issues in the Urban Connector application and providing information to calculate a social connectivity metric from the mobility perspective.

Task 3 – Design a survey

The purpose of this task was to design a survey to gather information on how seniors use the Urban Connector application for social connectivity from the mobility perspective. The survey has been designed as a pilot test that involves installing the Urban Connector application in participants' (senior's) Android and iOS smartphones and have them use the application for two weeks. Two survey instruments have been designed. The first one is an in-app survey to collect mobility data while the participants are using the Urban Connector application for every trip. The second instrument collects usage data through a questionnaire after the two-week pilot test. Along with the survey instrument, a pilot test protocol was established, and an analysis framework proposed to relate a senior's social connectivity to his/her travel patterns and individual trip data (described in the social connectivity metric).

3 METRIC OF SOCIAL CONNECTIVITY FOR THE SENIORS

3.1 Lifestyle and Challenges of Seniors

Seniors are legally defined by their age ranging from 55 to 67 years of age according to the criteria by established by different federal departments and agencies in the United States. The majority of the definitions used by agencies in the describe seniors as the segment of population with at least 65 years of age. According to the United States Census Bureau (2017), a senior is considered a person age 65 or older. The older population is a large segment in the U.S. population with different age groups lifestyles and needs. Seniors' needs are based on their physical (vision, hearing, appearance, etc.), mental health (depression, Dementia, Parkinson's, Alzheimer's, etc.) and health impairments (arthritis, cancer, osteoporosis, cardiovascular disease, high blood pressure, respiratory issues, etc.) (Sugar, 2020).

Accessibility to transportation options is a challenge for seniors who might experience any number of physical, mental health or chronic health impairments. As a person experiences an increase in age, his/her motor skills and cognitive ability deteriorates resulting in a decrease of distance and number of trips (Cui et al., 2017). When a senior is unable to drive safely, public transportation and shared rides become the only available modes that he/she can depend upon to visit family members, relatives, friends, to participate in community events, make medical visits, buy groceries and etc. Modern transportation methods often do not cater to the needs of seniors. The complexity of transportation options creates fear among the seniors due to confusing infrastructure, long waiting time, accessibility and proximity issues (Turner et al., 2017). Seniors without access to transportation may feel isolated from family members, friends and their community (Satariano et al., 2012).

Seniors who are socially isolated have double the mortality risk (Harada et al., 2018). To combat social isolation, seniors are starting to learn new ways the internet is allows them to connect with their loved ones through social media and other social applications. Czaja (2019) states that technology is an essential tool that helps seniors live independently and improve their well-being.

In 2015, the United States Census Bureau (2017) reported that 35.3 million older adults had computers in their homes and 30.9 million had access to the internet. Anderson and Perrin, (2017) stated that in 2016 the following percentages of seniors owned a smartphone, 59% of 65 to 69-year-olds, 49% of 70 to 74-year-olds, 31% of 75 to 79-year-olds, and 17% of 80-year-old and older.

The use of smartphone application is a potential technology that can contribute to improve senior's social connectivity in two ways:

1. providing information that makes seniors aware of the transportation options available, thereby increase his/her opportunity to travel;
2. providing social media applications allow seniors to communicate with persons at the other end to improve social connectivity.

For seniors to be interested in technology, seniors need to have a positive perception, need for technology platform, and willingness to invest in the technology (Peek et al., 2017). A mobile

smartphone application designed for seniors should consider their physical challenges (e.g., speech-to-text and text-to-speech technology might assist seniors with typing and/or reading difficulties) (Vechione et al, 2018).

3.2 Social Connectivity

Social connectivity measures how people come together and interact (Pappadopulous, 2018). The social connectivity encompasses the quantity, quality, frequency, type and network structure of one's relationship with friends, family and the community (Ang, 2019). Mick, Kawchi, and Lin (2014) mention that there are many types of support that an individual can offer when then connect with others such as assistance, advice, reinforcement, financial, emotional support when needed. Social connectivity plays an important role in older adults' well-being (Ashida and Heaney, 2008; Gardner, 2011; Haslam et al., 2008), and has a positive effect on physical and mental health (Cornwell et al., 2008).

Seniors are less likely to participate in social activities as they age (Ang, 2019). Millions of seniors are experiencing isolation, loneliness, and a lack of social connections (Hudson, 2017).

As people age, their vision and motor skills decline (Sugar, 2020), making personal transportation and ability to drive more difficult. Public transportation methods are perceived by seniors as unsafe, expensive, out of reach, and not punctual (Jones et al., 2018). In the mobility need survey (the first survey), seniors expressed concern when they had to travel through congested zones and the likelihood of experiencing delays to arriving at their designated destinations. The long-term goal of the Urban Connector application is to facilitate decision making that addresses the specific mobility needs of seniors.

3.3 Measures of Social Participation

Social connectivity may come from formal social participation and informal social participation. Formal social participation means engagement in community groups and organizations. Informal social participation refers to the interactions with family, relatives and friends (Ang, 2019). A person's social connectivity may change over time as adults experience changes in life circumstances such as aging, retirement, bereavement and health problems (Ang, 2019). As a person get older, the network of friends shrinks, as seniors tend to prefer quality relationships over the quantity of friends (Sugar, 2020). Close relationships affect seniors positively depending on the amount of leisure activities and social engagement opportunities (Maness, 2017). When seniors have strong social relationships, they can combat depression by engaging in community activities. It is important for seniors to have connections to interact with other people and resources in the community to help older adults get what they need (Carbone and McMillin, 2019). Having people around is greatly beneficial for older adults who thrive on a sense of community and belonging (Sugar, 2019). Our research has been based in collaboration with Senior Centers in the City of El Paso, and from these spaces we can confirm that seniors who visit Senior Centers are more likely to connect with other seniors, with staff, and services provided in these community spaces.

Ang (2019) studied the decline in social participation of several cohorts of adults over a 25-year longitudinal study. The participants' social activities were measured from the responses gathered

in four questions which were asked during the same survey given at different time points. These four questions were:

- (a) “How often do you attend meetings or programs of groups, clubs, or organizations that you belong to?”
- (b) “How often do you usually attend religious services?”
- (c) “How often do you get together with friends, neighbors, or relatives and do things like go out together or visit in each other's homes?” and
- (d) “In a typical week, about how many times do you talk on the telephone with friends, neighbors, or relatives?”

Questions (a) and (b) solicited responses about participants’ formal social participation. Questions (c) and (d) sought responses about participants’ informal social participation. The response categories for questions (a), (b) and (d) were: (1) more than once a week; (2) once a week; (3) two or three times a month; (4) about once a month; (5) less than once a month; and (6) never. Response categories for question (c) were: (1) more than once a day; (2) once a day; (3) two or three times a week; (4) about once a week; (5) less than once a week; and (6) never or no phone. These questions and responses were incorporated into the measures in the social connectivity metric.

3.4 The National Household Travel Survey

The National Household Travel Survey (NHTS) (FHWA, 2019) is a nationwide authoritative survey conducted by Federal Highway Administration (FHWA) once every five to 10 years. The most recent survey was completed in 2017 with the participation of 129,112 households. The purpose of the survey was to gather data from randomly selected households to study the trend in personal and household travels. The survey collected four categories of data which are listed in Table 1.

Table 1 National Household Travel Survey data (from (FHWA, 2019))

Data category	Data gathered
Household characteristics	Number of people Number of licensed drivers Number of workers Number of vehicles Annual household income
Traveler characteristics	Age Gender Education Driver status Working status Annual distance traveled
Vehicle characteristics	Make Model Year Years owned Odometer reading
Trip characteristics	Origin and destination Time started and ended Distance traveled Mode of transportation Trip purpose Number of people travel on the same trip

The data collected in the NHTS are summarized and reported to the Congress, make available for the state agencies and the public. The following elements of the NHTS protocol, summarized from (FHWA, 2019), were used as a reference by the research team when developing the survey protocol for the seniors:

1. The survey instructions and hard copy of Travel Logs (FHWA, 2018b) were mailed to the household.
2. On the day randomly selected survey day, every member of the household filled in their trip information in the Travel Logs.
3. The entries in the Travel Logs were entered by participants into a central database via a web-based portal. Alternatively, the survey participant may request for a telephone interview to have the interviewer transcribed the data from the Travel Log into the database.
4. Upon successful completion of the survey, each household will receive a \$20 gift card in the mail.

The mails, survey instructions, survey instruments and telephone interviews were available in both English and in Spanish.

In the NHTS, each participating household must complete a Recruitment Survey (FHWA, 2018a). The Recruitment Survey has 16 questions. From those 16 questions, the ones that were adopted for the survey designed in this project were:

- frequency of travel by the various modes;

- frequency of the use of various computing devices to access the Internet; and
- demographic profile of each household member.

The Travel Logs (FHWA, 2018b) is a hardcopy form for each member of the household to record all the trips made in the selected day. For every trip, the household member must record the trip start time, destination's address or the nearest intersection, mode of transportation, number of people in the traveling party, trip purpose, departure time to the next location. The information solicited in the Travel Logs that was included in surveys designed for this research refer to the trip purpose, and type of destination (modified from destination's address or nearest intersection).

The information of selected questions in the Recruitment Survey and Travel Logs contribute to the proposed metric for social connectivity that can be provided by users of the Urban Connector application after completing their daily trips.

3.5 Proposed Metric

Ang (2019) used the frequency of attending group, religious and community activities to measure the level of formal social participation. The frequency of face-to-face meetings or conversations on the phone with neighbors, friends and relative was used to estimate the level of informal social participation. Both numerical frequencies may be used as indicators of social connectivity.

In addition to measuring the frequencies of interactions, the length (duration) and quality of interactions are also important. The frequency, duration of stay at the destination, number of persons traveling were asked in the NHTS (FHWA, 2018a, 2018b). The frequencies of visits or meetings, the duration of the event, and the number of people interacted with can easily be quantified and recorded. However, the quality of interaction with people are subjective.

Considering the above factors, the research team organized the concept of measuring social connectivity into trip-based indicators, measures and possible values, and proposed the metric in Table 2. This table was used in the creation of survey instruments and subsequently the framework for data analysis. None of the indicators, measures and possible values in Table 2 asks for personal information such as name, address (or the trip origin and destinations) which is critical in protecting the identity and privacy of the person who provides the data.

Table 2 Metric of social connectivity from the mobility perspective for the seniors

Indicator	Measures	Possible values
Type of interactive event	Trip destination	Work Volunteer Visit family, relative or friend Grocery or retail store Healthcare or pharmacy Religious center Restaurant or coffee shop Bank or ATM
	Trip purpose	Work Volunteer Visit family, relative or friend Grocery or retail store Healthcare or pharmacy Religious center Restaurant or coffee shop Bank or ATM
Frequency of interactive event	Number per week	0 (never) >0 but <1 (not every week) 1 to 3 4 to 6 7 or more (every day)
Duration of interactive event	Duration of the event	0 to 15 minutes 16 to 30 minutes 31 to 45 minutes 46 minutes to 1 hour Longer than 1 hour
Quantity of interaction	No. of people interacted with	0 1 to 3 4 to 7 8 or more
Quality of interaction	Rating of quality of interactions	Not connected Somewhat connected Moderately connected Well connected Very well connected

4 UPDATE OF THE URBAN CONNECTOR APPLICATION

4.1 Previous Works on Urban Connector

During the first year in the development of the Urban Connector, the team focused on: (i) understanding the mobility needs of older adults, and (ii) designing and developing a prototype to cater the mobility needs of older adults. The Urban Connector team designed a survey instrument to identify the mobility needs of seniors and surveyed seniors in El Paso, Texas and New York, New York. With the information gathered, the Urban Connector developers designed and implemented a native Android application prototype with limited capabilities: (i) storing home address; (ii) storing addresses for “Family & friends” (Vechione et al., 2018); and (iii) redirecting to a third-party navigation application for the generation of routes from a specific destination.

In the subsequent year, the research focused on recruiting participants for beta-test in order to better improve the mobile application (Vargas-Acosta et al., 2019). Key findings in the second year of study included that the smartphone application should cater for the physical needs of older adults and user feedback to help improve the Urban Connector application (e.g., increase font-size, speech-to-text, text-to-speech, simple interfaces), be inexpensive or free, multilingual (e.g., support both Spanish and English), and should have clear explanations on the use of personal data (e.g., asks users if they are willing to share data).

4.2 Updates of Urban Connector

In this project, the Urban Connector application was refined for capturing social connectivity data from the mobility perspective. **Error! Reference source not found.** illustrates the look and feel of the initial screen of the Urban Connector application. This screen was available in the prior version of the application that this project built on. The Urban Connector uses icons made by Freepik from www.flaticon.com. Figure 2 and Figure 3 illustrate the look and feel of the current version of the Urban Connector application to enable the capture of social connectivity data from the mobility perspective. Figure 2 and Figure 3 are part of the survey instruments which are described in more detail in Chapter 5.

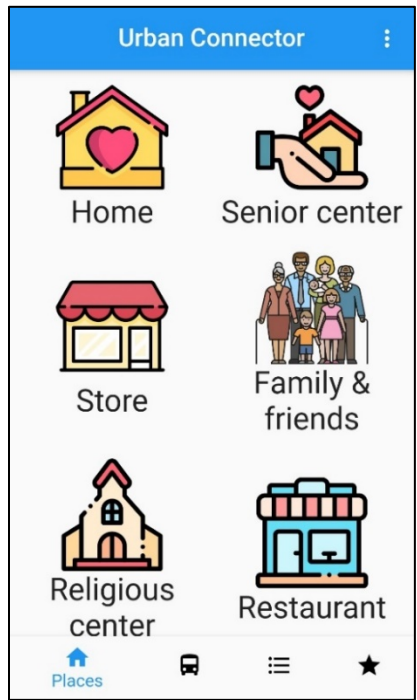


Figure 1 Urban Connector home screen of the version used to build the social connectivity functionality

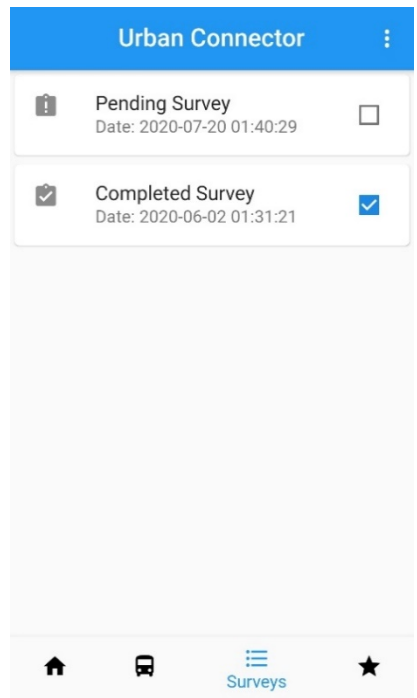


Figure 2 Urban Connector Travel Log screen

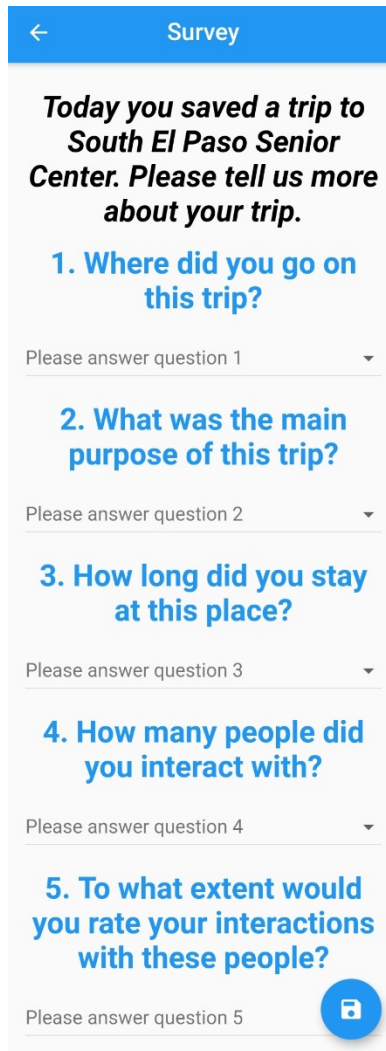


Figure 3 Urban Connector Travel Log questions

4.3 Data Privacy

The Urban Connector application was refined for this project using good practices and guidelines for data privacy (Papageorgiou et al., 2018), i.e., only collecting the necessary data to calculate the social connectivity metric. The data management for the Urban Connector application includes the following considerations:

- (i) Design the application to capture minimum amount of personal information;
- (ii) Sampling of traveling data (i.e., only one trip per day);
- (iii) Download/transfer only deidentified/anonymous data from the smartphone for analysis; and
- (iv) Identify privacy algorithms for the sharing of data collected in the Urban Connector application.

The development team analyzed the information that would be stored or transferred using the Urban Connector application and identified information that could potentially lead to the

reidentification of individuals (Narayanan and Shmatikov, 2006). This information included: names, addresses, device location, email, emergency phone numbers, and travel routes. The research team opted for refining the Urban Connector application with features that capture data related to social connectivity from the mobility perspective and not developing features that would require the recording of the following information: names, email, emergency phone numbers, and travel routes. Also, the information being recorded in the previous version of the Urban Connector application was analyzed to identify if it would be stored locally or shared with the Urban Connector server. As a result, addresses with identifiers (e.g., home address) were stored in the mobile device for the purpose of using third-party tools for navigation, but this information was only used locally and not shared with Urban Connector development team (i.e., downloaded from the user's smartphone). The Urban Connector application redirects users to third-party tools for the generation of routes for a trip (i.e., Google Maps for Android devices or Apple Maps for iOS devices). A notification is shown to users to inform them that these third-party tools are independent of the Urban Connector application and they may collect additional information. This decision was made to provide guidance to users when using different applications and tools on mobile devices.

The Urban Connector application only collects the necessary data to calculate a social connectivity metric. To achieve this, the connectivity metric (Table 2) has been designed to collect statistics from anonymous trip information. Correspondingly, data to be collected during the travel survey only involves anonymous trip information. Trip information that is collected describes the trip such as trip purpose and number of persons interacted, information that can identify the location or the person visited is not collected (see Table 1).

The current version of the Urban Connector application collects the following user's information for every trip registered in the application: (i) destination; (ii) purpose of the trip; (iii) time spent at the destination; (iv) number of people interacted with, and (v) a rating of quality of the interaction. All this information is entered by the user through a questionnaire provided, users can choose not to provide information for a specific trip.

The collection of trip information occurs in two stages. The first stage, the sampling stage, takes place when a user manually selects a frequent place in the Urban Connector application, the algorithm verifies in its internal database if a trip is registered for that specific day. If no trip is not registered for that specific day, the application prompts the user if she/he wishes to register and create a survey for that trip. If the user approves, the trip is registered and a survey is created. Otherwise, the trip is not registered. If a trip is already registered for that day, no further action is taken (i.e., no additional surveys are created). Once a survey for a specific trip is created, the user can enter the information in any time by opening the surveys screen in the Urban Connector application (Figure 2). If at the end of the day there are surveys pending, the Urban Connector application reminds users of pending surveys.

The second stage of data collection involves the downloading of trip-related, non-identifiable data from the user's mobile device for analysis. Collected data in the Urban Connector application is stored locally in the user's device. It is recommended that the survey data collection is performed through manual transferring of data that can be shared outside the device for analysis by the Urban Connector development team. This design decision of not sending data continuously to a remote

server reduces the potential security breach when transferring the information. In addition, having the data transferred by cable from the mobile device to Urban Connector development team's laptop avoid the consumption of the user's data plan.

The first technique identified to be useful in the sharing of data collected through the Urban Connector application include the injection of noise, using for example the Laplace distribution (Dwork and Roth, 2014). This technique preserves the utility of data but makes difficult to reidentify Urban Connector users. Differential privacy (Dwork and Roth, 2014) has been used for sharing aggregated data (Shi et al., 2011). Therefore, it is recommended to be used for data sharing in the Urban Connector. Differential privacy focuses on providing information about data sets (rather than a specific individual part of the data set), and the information that can be derived from those data sets in the aggregate (Dwork and Roth, 2014).

5 SURVEY DESIGN

To meet the third objective of this project, the research team designed a survey. This chapter presents the proposed survey and recommendations to implement this survey. This survey uses the Urban Connector application for data collection. The recommendations for implementing this survey are first described in Section 5.1. The survey instruments presented in Section 5.2. Section 5.3 describe the data analysis framework that has been proposed.

5.1 Recommendations for Survey Implementation

5.1.1 Recommended Methodology

This survey aims to collect data to analyze social connectivity from the mobility perspective. The survey will also provide information on how the Urban Connector application can be used to collect relevant data with privacy in mind as described in section 4.3. The recommended methodology include: i) recruiting seniors to participate in the survey, ii) install the refined version of Urban Connector application in their smartphones, iii) collect daily trip information through a questionnaire available in the Urban Connector application for two weeks, and iv) after the two-week period ask the participants to complete an Exit Survey questionnaire. The Urban Connector application, in-application Travel Log questions and face-to-face Exit Survey instrument are provided in English and Spanish.

5.1.2 Recommended Recruitment Plan

The proposed survey targets adults above 55 years old in El Paso should be recruited. This age criterion is used by the City of El Paso Parks and Recreation Senior Centers' for delivering services to seniors in El Paso, TX. This criterion was also used in the previous two years of the Urban Connector development when recruitment seniors. Based on the research team's previous experience, it is recommended to recruit participants in places that they frequently visit such as the senior centers as well as events organized in these venues. Providing incentives (e.g., water bottles or reusable bags) and marketing information such as flyers and posters can attract the interest of potential participants. Given the bicultural population of seniors in El Paso, it is recommended to provide consent forms and survey questions in English and Spanish. To keep the survey anonymous, it is recommended that the research team does not collect names, addresses, or any personal contact information from the participant.

5.1.3 Recommended Data Collection

The survey has been designed to have each participant use the Urban Connector application every day for two weeks (14 days). Every day during the two-week period, the Urban Connector application will register the first trip approved by the participant that made in the last 24 hours. Once a trip is registered, the corresponding survey is automatically created within the Urban Connector application, and the participant can enter his/her daily Travel Log at any time (Figure 3). In addition, the Urban Connector application will display notifications at the end of the day about pending surveys. The daily Travel Log collected data is described in sub-section 5.2.1.

After the fourteen day, the research team would contact the participant to arrange a meeting. It is recommended that this meeting is held at a public venue, and preferably the same one where the participant was recruited. During this meeting, the researcher would download only the anonymous Travel Log data from the participant's smartphone and conduct the Exit Survey. It is recommended that no personal or locational data would be downloaded as described in section 4.3. The transfer of data from the participant's smartphone to the researcher's laptop is recommended to be performed using physical cable. It is recommended to provide participants with an incentive (e.g., \$20 gift card) at the end of the two-week period for their contribution.

The downloaded anonymous Travel Log data and the Exit Survey responses would be entered into a survey software approved by the institution.

5.2 Survey Instruments

As mentioned, the proposed survey consists of two instruments. The first survey instrument is the in-application, daily Travel Log. The second survey instrument is an Exit Survey.

5.2.1 Daily Travel Log

The in-application, daily Travel Log is designed to collect data that can be used to measure the individual trips contributions to the participant's social connectivity. This survey instrument consists of five questions concerning a trip made during the past 24 hours. The participant is expected to complete the daily Travel Log every day during a fixed time. The Urban Connector application will display a questionnaire with the following five questions (Figure 3):

1. Where did you go on this trip?
2. What was the main purpose of this trip?
3. How long did you stay at this place?
4. How many people did you interact with?
5. To what extent would you rate your interactions with these people?

Each question consists of multiple-choice answers. Questions 1 and 2 asks about a trip's purpose. Questions 3 and 4 ask the participant about the quality of the trip: the duration of his/her stay at the destination and the number of people he/she interacted with. The last question asks the participant to rate the quality of his/her interaction with people. Figure 4 is a screenshot of the questions as they appear on a smartphone screen. The English and Spanish version of the questions and answers available for each question are listed in Appendix A.

5.2.2 Exit Survey

The Exit Survey consists of 23 questions divided into five sections. The name of the sections and the number of questions in each section are listed in Table 3. The English and Spanish version of the survey instrument are included in Appendix B.

Table 3 Organization of Exit Survey questionnaire

Section no.	Name	No. of questions
1	Use of communication media	3
2	Social interactions	5
3	Urban Connector	6
4	Participant's demographics	8
5	Feedback, comment or concern	1

Use of communication media

The three questions in this section (1-3) ask the participant how often he/she uses the phones and other types of media to communicate with people, what type of smart phone he/she owns, and the concerns related to privacy he/she may have when entering data into the smartphone.

Social interactions

The five questions in this section (4-8) solicit information about frequency of visiting places, duration of the visits, how many people they interact with per visit, mode of transportation and resources for social support.

Urban Connector

This section has six questions (9-14) concerning the participant's use of the Urban Connector application. The first question asks how often the participant used the Urban Connector application in the two-week period. The next three open-ended questions ask the participant to provide information on what motivated him/her to use the Urban Connector application, the reason of him/her not using the Urban Connector application, and any challenges faced when using the Urban Connector application. The last two questions of this section ask the participant to rate the level of social connection with their community they perceived before and after using the Urban Connector application.

Participant's demographics

The questions in this section (15-22) ask demographics characteristics of the participants including race/ethnicity, if they are Hispanic or Latino, gender, age range, marital status, type of residence, number of persons living in the household and zip code.

Feedback, comment or concern

The last question asks the participant to provide feedback on the use of the Urban Connector application.

5.3 Analysis Framework

Having collected data, the goal of the analysis framework in this sub-section is to provide guidance on modeling the relationships between social connectivity and its contributing factors.

There are five questions in the daily Travel Log (see Figure 3). The data to be collected by the daily Travel Log will contain individual trip's details. Assuming that there are 30 participants and each participant reported the information of 14 trips. There will be 420 person-trip records. For

each trip, the following social connectivity measures will be collected by the five questions: trip destination (Question 1), trip purpose (Question 2), duration of stay (Question 3) number of people interacted with (Question 4) and rating of quality of interaction (Question 5). The choices from four Questions 1 to 4 will be represented by dummy variables. That is, each choice is represented by a binary number; only the selected choice for each question carries a value of 1 while the remaining unselected choices have values of 0. There will be a total of 29 dummy variables from all the choices in Questions 1 to 4. The ratings of quality of interaction (Question 5), which is the participant's perceived outcome for a trip, will be coded as $k = 1, 2, 3, 4, 5$ for not connected, somewhat connected, moderately connected, well connected and very well connected, respectively.

The Exit Survey has 23 questions. Assuming that there are 30 participants, the same number of participants would complete the Exit Survey. The answers provided in each question in the Exit Survey represents the characteristics of the participant. Some of the variables may capture individual bias in the social connectivity prediction model. The answers for the following questions will be used to construct the model: frequency of use of urban connector (Question 9), race (Question 15), Hispanic/Latino (Question 16), gender (Question 17), age (Question 18), marital status (Question 19), type of residence (Question 20) and household size (Question 21). The choices for these questions contribute to 24 participant specific dummy variables. In addition, each zip code (Question 22) will be an additional dummy variable.

A model will be constructed from the responses gathered from the survey to predict a person-trip's quality of interaction as a function of dummy variables described above. The Multinomial Logit Model (MLM) (Greene, 2016) is suggested as the modeling approach.

The MLM is a common form of discrete choice models. Discrete choice models are models for predicting individual's choice out of a set of mutually exclusive alternatives. They are widely used to analyze human decisions as a function of contributing factors. In transportation, discrete choice models are commonly used in analyzing mode choices, i.e., the probability of a person's decision in using various transportation modes as a function of the characteristics of the respective modes (for examples see Bhat (1998), Barbour et al. (2020)). They are also frequently used in crash analysis to explain the probabilities of the various outcomes of a crash as a function of contributing factors (for examples see Shankar and Mannering (1996), Romo et.al. (2014)).

The proposed MLM analysis framework, which is a simpler form of formal and informal social participation models proposed by Ang (2010) but modified to take into consideration our social connectivity metric, takes the following form:

$$P_{ij}(k) = \frac{e^{-u_{ij}^k}}{\sum_{h=1}^5 e^{-u_{ij}^h}}, k = 1, 2, 3, 4, 5. \quad (1)$$

$$U_{ij}^k = a_{k0} + a_{k1}X_{ij}^1 + \dots + a_{km}X_{ij}^m + b_{k1}Y_i^1 + \dots + b_{kn}Y_i^n$$

$$= a_{k0} + \sum_{l=1}^m a_{kl}X_{ij}^l + \sum_{l=1}^n b_{kl}Y_i^l \quad (2)$$

where

i = a participant;

j = a trip made by a participant;

k = outcome of a trip = {1, 2, 3, 4, 5} representing the quality of interaction;

l = index of independent variables;

m = number of trip-specific independent variables from the Travel Log;

n = number of participant-specific independent variables from the Exit Survey;

X_{ij}^l = value of independent variable l for participant i making a trip j (from the daily Travel Log) = {0,1};

Y_i^l = value of independent variable l for participant i (from the Exit Survey) = {0,1};

a_{kl}, b_{kl} = coefficient of independent variable l for outcome k ;

a_{k0} = systematic (community bias) for outcome k ;

U_{ij}^k = deterministic utility value of participant i making a trip j resulting in outcome k ; and

$P_{ij}(k)$ = probability of participant i making a trip j resulting in outcome k .

This MLM predicts the probability of a subject (i), after making a trip (j), perceive as not connected ($k = 1$) to very well connected ($k = 5$). There are two groups of independent variables in the utility function. The first group of m variables (X_{ij}^l) are person-trip specific. The second group of n variables (Y_i^l) are subject specific but not person-trip specific. Their coefficients a_{k0} , a_{kl} , b_{kl} may be calibrated from the survey responses obtained in the Travel Log and the Exit Survey using the method of maximum log-likelihood (Greene, 2016).

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APPENDIX A IN-APP TRAVEL LOG QUESTIONS

In-App Travel Log Questions in English

1. Where did you go on this trip?
 - Home
 - Workplace
 - Volunteering place
 - Residence of family member, relative or friend
 - Grocery store, market or retail shop
 - Healthcare facility or pharmacy
 - Senior center, library, park, or gym
 - Religious center
 - Restaurant, coffee shop, diner
 - Bank, ATM
 - I did not go anywhere today
 - Other:
 - Prefer not to say

2. What was the main purpose of this trip?
 - Go Home
 - Go to Work
 - Go Volunteer
 - Visit family member, relative or friend
 - Go to Grocery store, market or retail shop
 - Go to Healthcare facility or pharmacy
 - Go to Senior center, library, park, or gym
 - Go Religious center
 - Go to Restaurant, coffee shop, diner
 - Go to Bank, ATM
 - I did not go anywhere today
 - Other:
 - Prefer not to say

3. How long did you stay at this place?
 - Up to 15 minutes
 - Up to 30 minutes
 - Up to 45 minutes
 - Up to 1 hour
 - More than 1 hour

4. How many people did you interact with?
 - 0
 - 1-3
 - 4-7
 - More than 8

5. How would you rate the quality of your interactions with these people?
 - Not connected
 - Somewhat connected
 - Moderately connected
 - Well connected
 - Very well connected

CTECH Cuestionario en la aplicación

1. ¿A dónde fue en este viaje? Por favor seleccione 1 respuesta.
 - Hogar
 - Lugar de trabajo
 - Lugar donde realiza voluntariado
 - Residencia de familiares o amigos
 - Tienda de comestibles, mercado, o de comercio menor
 - Centro de salud o farmacia
 - Centro para adultos mayores, biblioteca, parque, o gimnasio
 - Centros religiosos
 - Restaurantes o cafeterías
 - Bancos, Cajeros automáticos, u oficinas
 - No fui a ninguna parte hoy
 - Otro:
 - Prefiero no responder

2. ¿Cuál fue el propósito de este viaje?
 - Ir a casa
 - Ir a trabajar
 - Voluntario
 - Visita a un familiar, pariente o amigo
 - Ir a la tienda de comestibles, mercado o tienda minorista
 - Ir al centro de salud o farmacia
 - Vaya a un centro, biblioteca, parque o gimnasio para personas mayores
 - Ir al centro religioso
 - Ir al restaurante, cafetería, restaurante
 - Ir al banco, cajero automático
 - No fui a ninguna parte hoy
 - Otro:
 - Prefiero no decir

3. ¿Cuánto tiempo duro en este lugar?
 - Hasta 15 minutos
 - Hasta 30 minutos
 - Hasta 45 minutos
 - Hasta 1 hora
 - Más de 1 hora

4. ¿Con cuántas personas interactúo?
 - 0
 - 1-3
 - 4-7
 - Más de 8

5. ¿Como calificaría la calidad de sus interacciones con estas personas?
 - No conectado
 - Algo conectado
 - Moderado conectado
 - Bien conectado
 - Muy bien comunicado

APPENDIX B EXIT SURVEY QUESTIONNAIRE

CTECH Paper Survey Questions

Exploring Social Connectivity and Transportation Needs of the Seniors through a Mobile Smartphone Application

A team of researchers from the University of Texas at El Paso (UTEP) is doing research on the social interactions and mobility needs of seniors (older adults) in the city of El Paso. Seniors were asked to use a mobile application known as Urban Connector for a period of two weeks. This survey seeks feedback on the user experience on the application. Please answer the following questions to help us understand the of seniors in El Paso.

Use of Communication Media

1. How often do you use the following communication mediums to communicate and interact with people in a week? Please select 1 answer per row.

Use of communication mediums	Never	Less than once/ week	1 to 3 times/ week	4 to 6 times/ week	7 times or more /week
Telephone call with a flip phone					
Telephone call with a smartphone					
Text messages					
Smartphone applications (Facebook, Skype, WhatsApp, Twitter etc)					
Email					
Post-mail					
Internet websites with iPad, tablet, or Personal computer					
Other:					

2. What type of smartphone did you use the Urban Connector application for?
 - o Android (Samsung, LG, Motorola, Google, Nokia)
 - o Apple iPhone

3. Do you have any concern when you use and enter data into your smartphone?

Yes (select all that apply)

- Tracking (Monitoring your movements without your permission)
- Unreliable service (Slow device, disruption of service, application freezes or crashes)
- Unsecure WiFi network (Other people can have access to my information)
- Accepting terms and conditions without knowledge
- Hackers (Stealing personal information from my phone)
- Scams (False information provided through my phone)
- Private information made available to public through applications
- Phone companies selling my personal information
- Software companies selling my personal information
- Losing my phone with all my information (Pictures, addresses, telephones)
- Forgetting passwords
- Other (Please Specify):

No (Skip to the next question)

Social Interactions

4. How often do you visit the following places in a week? Please select 1 answer per row.

	Never	Less than once/ week	1 to 3 times/ week	4 to 6 times/ week	7 times or more /week
Workplace					
Volunteering place					
Family member, relative, or friends					
Grocery store, market or retail shop					
Healthcare facility or pharmacy					
Senior center, library, park, or gym					
Religious center					
Restaurant, coffee shop, diner					
Bank or ATM					
Other:					

5. On average, how long do you stay at the destinations when you visit? Please select 1 answer per row.

	Never	Up to 30 minutes	Up to 1 hour	Up to 2 hours	Up to half a day	More than half a day
Workplace						
Volunteering place						
Family member, relative, or friends						
Grocery store, market or retail shop						
Healthcare facility or pharmacy						
Senior center, library, park, or gym						
Religious center						
Restaurant, coffee shop, diner						
Bank or ATM						
Other:						

6. On average, how many people do you interact with when you visit the following places? Please select 1 answer per row.

	0	1-3	4-7	More than 7
Workplace				
Volunteering place				
Family member, relative, or friends				
Grocery store, market or retail shop				
Healthcare facility or pharmacy				
Senior center, library, park, or gym				
Religious center				
Restaurant, coffee shop, diner				
Bank or ATM				
Other:				

7. In a week, how often do you use the following modes of transportation? Please select 1 answer per row.

Modes of Transportation	Never	Less than once/ week	1 to 3 times/ week	4 to 6 times/ week	7 times or more /week
Drive my own car					
Get a ride from family, relative, friend					
Paid taxi, Uber or Lyft					
Public bus (Sun Metro, BRIO)					
On-demand service for people with special needs (LIFT)					
Bicycle					
Scooter					
Walking					
Other:					

8. If you need help getting to places, can you count on the following resources?

	Yes	No	Maybe
Household member (living with you)			
Family and relatives not living with you			
Friends			
Neighbors			
City services (police, ambulance, fire dept.)			
Volunteers			
Healthcare providers			
Other:			

Urban Connector

9. How often did you use the Urban Connector application in the past 2 weeks?

- 1 to 2 times a week
- 3 to 4 times a week
- 5 to 7 times a week
- 7 times or more a week

10. What motivated you to use the application?

11. What reason did you not use the application?

12. Did you encounter any particular challenge using the Urban Connector application? If so, please elaborate.

13. Before using Urban Connector, to what extent did you feel connected with my community?

- Not connected
- Somewhat connected
- Moderate connected
- Well connected
- Very well connected

14. After using Urban Connector, to what extent did you feel connected with the community?

- Not connected
- Somewhat connected
- Moderate connected
- Well connected
- Very well connected

Participant's Demographics

15. What is your race?

- White
- Black/ African American
- Asian
- American Indian or Alaska Native
- Native Hawaiian or Pacific Islander
- Other (Please Specify)

16. Are you of Hispanic or Latino?

- Yes
- No

17. What is your gender?

- Masculine
- Feminine
- Other

18. What is your age range?

- Less than 55
- 55-59
- 60-64
- 65-69
- 70-74
- 75 and over

19. What is your current marital status?

- Single (Never Married)
- Married
- Widowed
- Divorced
- Living in a committed partnership
- Other (Please Specify)

20. How would you describe your type of residence?

- House
- Apartment
- Senior citizen home
- Other

21. How many people live with you in your household?

- 1
- 2
- 3-5
- More than 5

22. What is the zip code of your primary residence?

23. Please provide any feedback, questions, or concerns regarding the Urban Connector

CTECH Cuestionario

Explorando las necesidades de conectividad social y transporte de las personas mayores a través de una aplicación móvil para teléfonos inteligentes

Un equipo de investigadores de la Universidad de Texas en El Paso (UTEP) está investigando las interacciones sociales y las necesidades de movilidad de las personas mayores (adultos mayores) en la ciudad de El Paso. Se les pidió a los adultos mayores que usaran una aplicación móvil conocida como Urban Connector por un período de dos semanas. Esta encuesta busca comentarios sobre la experiencia del usuario en la aplicación. Responda las siguientes preguntas para ayudarnos a comprender las personas mayores en El Paso.

Medios de Comunicación

1. ¿Con qué frecuencia utiliza los siguientes medios de comunicación para comunicarse e interactuar con personas en una semana?

	Nunca	Menos de una vez/semana	1 a 3 veces/semana	4 a 6 veces/semana	7 veces o más /semana
Llamada telefónica con un teléfono tipo concha (celular sin internet)					
Llamada telefónica con un teléfono con servicio a internet (teléfono inteligente, iphone, Android)					
Mensajes de texto					
Aplicaciones para teléfonos inteligentes (Facebook, Skype, WhatsApp, Twitter, etc.)					
Email					
Correo postal					
Sitios web de Internet con Ipad, tableta o computadora personal					
Otro:					

2. ¿Qué tipo de teléfono inteligente usó en la aplicación Urban Connector?
- Android (Samsung, LG, Motorola, Google, Nokia)
 - iPhone de Apple

3. ¿Tiene alguna preocupación cuando usa e ingresa datos en su teléfono inteligente?
 Sí (seleccione todos los que correspondan a continuación)
- Seguimiento (Monitorear tus movimientos sin tu permiso)
 - Servicio no confiable (dispositivo lento, interrupción del servicio, congelación o bloqueo de aplicaciones)
 - Red WiFi no segura (otras personas pueden tener acceso a mi información)
 - Aceptar términos y condiciones sin conocimiento
 - Hackers (robando información personal de mi teléfono)
 - Estafas (información falsa proporcionada a través de mi teléfono)
 - Información privada puesta a disposición del público a través de aplicaciones
 - Compañías telefónicas que venden mi información personal
 - Compañías de software que venden mi información personal
 - Perder mi teléfono con toda mi información (fotos, direcciones, teléfonos)
 - Olvidando contraseñas
 - Otro (especifique):
- No (pase a la siguiente pregunta)

Interacciones Social

4. ¿Cuántas veces a la semana visita los siguientes lugares? (Seleccione una respuesta por línea)

	Nunca	Menos de una vez/semana	1 a 3 veces/semana	3 a 6 veces/semana	7 veces o más /semana
Lugar de trabajo					
Lugar donde realiza voluntariado					
Residencia de familiares o amigos					
Tienda de comestibles, mercado, o de comercio menor					
Centro de salud o farmacia					
Centro para adultos mayores, biblioteca, parque, o gimnasio					
Centros religiosos					
Restaurantes o cafeterías					
Bancos o Cajeros automáticos					
Otro:					

5. En promedio, ¿cuánto tiempo se queda en los destinos cuando visita los siguientes lugares? Por favor seleccione 1 respuesta por fila.

	Nunca	Hasta 30 minutos	Hasta 1 hora	Hasta 2 horas	hasta medio día	Mas de medio día
Lugar de trabajo						
Lugar donde realiza voluntariado						
Residencia de familiares o amigos						
Tienda de comestibles, mercado, o de comercio menor						
Centro de salud o farmacia						
Centro para adultos mayores, biblioteca, parque, o gimnasio						
Centros religiosos						
Restaurantes o cafeterías						
Bancos o Cajeros automáticos						
Otro:						

6. En promedio, ¿con cuántas personas interactúa cuando visita los siguientes lugares? Por favor seleccione 1 respuesta por fila.

	0	1-3	4-7	Mas de 7
Lugar de trabajo				
Lugar donde realiza voluntariado				
Residente de familiares o amigos				
Tienda de comestibles, mercado, o de comercio menor				
Centro de salud o farmacia				
Centro para adultos mayores, biblioteca, parque, o gimnasio				
Centros religiosos				
Restaurantes o cafeterías				
Bancos o Cajeros automáticos				
Otro:				

7. ¿Cuántas veces usa cada uno de los siguientes medios de transporte en una semana?
(Seleccione una respuesta por línea)

Modos de transportacion	Never	Menos de una vez/semana	1 a 3 veces/semana	3 a 6 veces/semana	7 veces o más /semana
Conduzco mi propio auto					
Familiar, pariente, o amigo me llevo					
Taxi pagado, Uber o Lyft					
Autobús público (Sun Metro, BRIO)					
Servicio para personas con necesidades especiales (LIFT)					
Bicicleta					
Motocicleta					
Caminando					
Otro:					

8. Si necesita ayuda para llegar a lugares, ¿puede contar con los siguientes recursos?

	Si	No	No estoy seguro
Familiar (vive con usted)			
Familiar que no vive con usted			
Amigos			
Vecinos			
Servicios de la ciudad (policía, ambulancia, departamento de bomberos)			
Voluntarios			
Proveedores de servicios de salud			
Otros:			

Urban Connector

9. ¿Qué tan frecuente utilizó la aplicación de Urban Connector en las últimas 2 semanas?

- 1 a 2 veces por semana
- 3 a 4 veces por semana
- 5 a 7 veces por semana
- 7 veces o más a la semana

10. ¿Qué fue la motivación por la que uso la aplicación?

11. ¿Qué fue la razón por la que no uso la aplicación?

12. ¿Encontró algún defecto particular al usar la aplicación Urban Connector? Si es así, por favor explique.

13. Antes de usar Urban Connector, ¿cómo se sentía conectado con la comunidad?

- No conectado
- Algo conectado
- Moderado conectado
- Bien conectado
- Muy bien comunicado

14. Después de usar Urban Connector, ¿cómo se sintió conectado con la comunidad?

- No conectado
- Algo conectado
- Moderado conectado
- Bien conectado
- Muy bien comunicado

Demografía del Participante

15. ¿Cuál es su etnia/raza?

- Caucásico
- Afroamericano
- Asiático
- Nativo americano/ Nativo de Alaska
- Nativo de Hawái o de las islas del Pacífico
- Otro:

16. Es Hispanico o latino?

- Si
- No

17. ¿Cuál es su género?

- Femenino
- Masculino
- Otro:

18. ¿Cuál es su rango de edad?

- Menos de 55
- 55 a 59
- 60 a 64
- 65 a 69
- 70 a 74
- 75 o mayor

19. ¿Cuál es su estado civil actual?

- Soltero, (Nunca Casado)
- Casado
- Viudo
- Separado/Divorciado
- Viviendo en una relación comprometida
- Otro:

20. ¿Cuál es el tipo de su residencia?

- Casa
- Apartamento
- Residencia para adultos mayores
- Otro:

21. ¿Cuántas personas viven con usted?

- 1
- 2
- 3-5
- Mas de 5

22. ¿Cuál es el código postal de su residencia?

23. Por favor anote comentarios, preguntas o inquietudes sobre la aplicación Urban Connector.