

## **POLICY AND ORGANIZATION GROUP Committee Triennial Strategic Plan (TSP)**

**Committee Name and Number:** ADB20, Effects of Information and Communication Technologies on Travel Choices

**Committee Chairperson:** Sivaramakrishnan (Siva) Srinivasan, University of Florida

**TSP Three-Year Period:** April 15, 2017 – April 15-2020

**Date Prepared:** March 2017

### **Committee Future Outlook Statement**

#### Committee Scope

The scope of the committee is to further the use of conceptual, methodological, and empirical studies to understand the interrelationships between the use of information and communication technologies (ICTs) and travel patterns. The objective is to analyze how various ICT devices/channels/services are used by travelers to make travel choices. These are useful for travel forecasters and planners as well as transportation operators and service providers to develop and deliver efficient mobility solutions.

#### Factors and Influences that Will Shape the Committees Activities

Rapid technological change and its proliferation among large segments of the population will have significant impacts on the committee's agenda and activities. The current research agenda of the committee builds upon topics identified in previous TSPs by recognizing the need to address recent factors affecting technological changes and the related changes to society.

A detailed discussion about critical and cross-cutting issues of interest to the committee is included as Appendix A. Based on feedback from committee members and friends, and along the lines of recent efforts, the following major thematic elements emerge:

1. The use of Virtual and Augmented Reality technologies and serious games to understand the behavioral impacts of rapidly emerging technologies such as Automated and Connected vehicles which do not have adequate market penetration levels to be studied using conventional revealed preference techniques
2. Improve understanding of adoption of emerging transportation technologies and trends on travel choices and activity, including the adoption and use of shared mobility services (also including developments in electronic linked transit fare cards, use of mobility apps, integration of public transit and bike-sharing programs, etc.).

3. Investigate the influence of mobile technologies, social networks and real-time information on travel patterns, e.g. the ability to make and instantaneously update decisions in real time, etc. on travel choices.
4. Analyze the relationships between the information provided through a variety of communication channels/services and activity-travel choices. Explore the impacts on various travel components, e.g. work trips, activity scheduling, leisure activity/travel choices, long-distance travel, e-shopping and fast delivery, long-term implications for land use, etc.
5. Use large volumes, rates, and velocities of data ("Big Data") and apply them to travel behavior studies.

### Committee Future Outlook

The committee will continue its cooperation with other TRB committees active in the area of transportation planning, travel behavior research, data collection and travel demand modeling, to improve the understanding of the generation of travel behavior which ultimately can result in better forecasting at a time of large changes in transportation, technology, and society. Within this broad umbrella, the committee plans to emphasize on three major areas in the future:

- Serve as a focal point of research on Information and Communication Technologies within the TRB system. This will call for increased collaboration with several of the other TRB technical committees as ICTs are becoming an increasingly integral part of almost all aspects of transportation. An immediate step is to create a community of researchers interested in the area using games and VR/AR for understanding travel behavior and choices.
- Serve as a liaison of the TRB and the transportation research community to the non-transportation researchers and entities that are extremely influential in shaping the nature and reach of technological advancements. These non-traditional transportation researchers include technology companies, data vendors, application developers, and social-media researchers. Analytics and Visualization competitions would be actively pursued as a way to create more synergistic activities.
- Facilitate the transfer of knowledge about the new technologies and its implications for transportation planning/design/operations/management to the public agencies and other practitioners. A particularly important emphasis area would be on the impacts of Autonomous and Connected Vehicles on travel and this effort would be undertaken along with other committees such as ADB10 and ADB40.

### Committee Plan

The committee will continue to undertake traditional activities such as issuing calls for papers, and organizing workshops and podium/poster sessions (jointly with other committees) to promote research and knowledge exchange on all technical areas of interest to the committee.

Several members of the committee serve as informal liaisons to other TRB committees. Formal relationships will be established with several TRB committees that may be addressing specific

applications of ICTs. An active exchange of information across committees will be facilitated. An immediate step would be to develop a community of researchers interested in the areas of gaming, VR, and AR applications to understand travel behavior spread across multiple committees of the TRB. This is an outcome of the 2017 Sunday workshop.

Non-traditional stakeholders (data vendors, app developers, etc) will be identified and their participation in the committee activities will be encouraged and facilitated. This can be in the form of presentations to the committee at the annual meeting or as webinars during the year. We will also seek to organize more data analytics competitions in order to open up private sector data to researchers (in academia, private, and public sectors).

A web site will be established to serve as an archive of committee information and activities. MyTRB will be used to maintain the list of friends and the use of other mailing list will be discontinued (after adequately encouraging the members on the current mailing list to friend the committee on MyTRB).

The committee will seek to actively include members from public agencies. These members will bring to the committee the current needs of the public agencies at large and help identify how the committee can help provide knowledge/technology transfers (such as via webinars). They will also be our champions in identifying and formalizing research needs statements.

Over the past few years, most of the podium sessions organized by the ICT committee were moderated by the young members. This practice will continue and young members will be encouraged to take on more responsibilities. TRB routinely provides committees with names of new/young attendees who have expressed interested in the committee. We will follow up with those persons and engage them as friends or members as appropriate.

The committee also plans to maintain its international representation in membership. The rates of changes in ICT adoption and use are particularly striking in developing counties and the committee would seek to be inclusive of research and developments taking place there as well. In this context, the committee will maintain its relationship with Special Interest Group 6 (SIG 6) “Information and Communication Technologies and Transport” of the World Conference on Transportation Research Society (WCTRS).

### **Committee History**

As of January 2017, the ADB20 Committee has 18 regular members, 1 young member, and 2 emeritus members (Copy of the Diversity Report is included as Appendix B). The committee had its triennial rotation in 2016. One third of members were rotated off (including two state DOT members) and three-fourths of young members were upgraded to regular member category. Several new members will be appointed during this year to fill the vacant slots from the list of prospective members maintained by the chair and with approval from the section chair.

The ICT Committee reviewed a total of 42 papers for presentation at the 2017 Annual Meeting (30 were submitted only for presentation and the rest were submitted for both presentation and

publication). Twenty five of these were accepted for presentation. Two podium sessions were organized to present these papers. Five papers have been accepted for publication in Transportation Research Record.

In 2015, The ICT committee co-sponsored a Sunday workshop titled “Impacts of New Data and Information Technologies on Transforming Traveler Experience” along with the TRB committees on User Information Systems and ITS. In 2017, a workshop titled “Lets Play! Inferring travel choices with virtual reality and games” was organized.

The committee has consistently taken advantage of the “Non Traditional Stakeholder” program for the past three years to invite and involve persons who would not typically make it to TRB / ICT Committee meeting. Peeter Kivestu (Terradata, 2014), Scott Kolber (Roadify Transit, 2015), and Barry Einsig (Cisco Systems, 2016) make presentations at committee meetings. In addition, they also presented at workshops (Kolber, 2015) and moderated podium sessions (Kivestu, 2014). Even though this program was discontinued in 2017, the Sunday workshop featured two external speakers (Sri Kalyanaraman, Journalism and Communications and Joe Geigel, Computer Science).

In late 2016, the committee also conducted the data analytics competition using data provided by AirSage. This contest was opened in October and over 35 teams downloaded the data. Sixteen submissions were received by the contest end date in mid-December. These were reviewed by academics, AirSage staff and staff from Metroplan Orlando (the Orlando MPO, the data were from the Orlando region). Five winners were selected and invited to present their work at TRB 2017. These presentations were scheduled in the business meetings of the ICT committee and sub-committees.

The business meeting of the committee averages an attendance of about 50 persons. The committee maintains an extensive list of friends (250+) in a form of an e-mail mailing list and via the MyTRB site.

Summary of activities from the previous three years from the annual reports:

|                                     | <b>2013</b> | <b>2014</b> | <b>2015</b> |
|-------------------------------------|-------------|-------------|-------------|
| Papers Reviewed                     | 12          | 41          | 41          |
| Papers Recommended for Publications | 1           | 6           | 6           |
| Number of Podium Sessions           | 1           | 2           | 2           |
| Number of Workshops                 | 0           | 0           | 0           |
| Number of Poster Sessions           | 1           | 1           | 2           |
| Number of Co-sponsored sessions     | 3           | 2           | 2           |
| Number of Meetings                  | 1           | 1           | 1           |

**Appendix A:**  
**Discussion of Critical and Cross Cutting Issues**

The research agenda of the ADB focuses on the relationships between Information and Communication Technologies (ICTs) and travel behavior, and in particular:

1. Analyze the relationships between the information provided through a variety of communication media/services and activity-travel choices (involving conceptual, methodological and empirical studies on the interrelation between ICTs) and activity-travel choices).
2. Impacts of different technologies and channels of communication, e.g. what information is sought / accessed and what are the travel implications?
3. Adoption of various forms of technologies among various population segments (younger generations, impacts of social media, etc.), including:
  - a. Who are the early/late adopters and what drives these choices?
  - b. What are the impacts on behaviors including inertia (reluctance to change) and cohort effects (e.g. young adults, or millennials, are exposed to technology from their childhood and are heavy adopters of technology, but how does that relate to travel choices?)
  - c. What devices are owned and what types of services are subscribed to? A multitude of devices including computers, tablets and smartphones provide access to the internet/information through various apps, access to social media and other internet services;
  - d. What are the relationships between social media and travel behavior?
  - e. What are the implications for connectivity versus social seclusion?
4. Impacts of ICTs (also in the context of social network decision making) on various travel components, including:
  - a. What are the impacts on work-related trips and activity scheduling?
  - b. What are the impacts on leisure activity-travel choices?
  - c. What the impacts on long-distance distance travel patterns?
  - d. How is e-shopping and fast delivery (“Amazon Prime” model) and on shopping and travel behaviors?
  - e. How are the implications of the relaxation of space-time constraints allowed by ICTs on individual behaviors including multi-tasking and fragmentation of activity-patterns?
  - f. What are the long-term implications for land-use?
  - g. What is the impact of ICTs on the utility/value of travel time?

5. Influence of mobile technologies, social networks and real-time information on travel and activity patterns, e.g. ability to make and instantaneously update decisions in real time, etc.:
  - a. What are the impact of travel information on the travel choices?
  - b. How does the ability to make and instantaneously update decisions based on real-time transportation (and non-transportation) data affect choices?
  - c. How does the penetration of ICT (in particular, portable) devices and services contribute to reshaping activity and travel choices?
  - d. How and to what extent are mobile technologies integrated in a decision-making process?
  - e. What are the impacts of the integration on activity participation and travel choices? How do mobile technologies interact with traditional ICTs in affecting activity participation and travel choices?
  - f. Do they substitute for or complement traditional ICTs?
6. Explore and harvest the opportunities for innovative applications of ICTs in data collection:
  - a. Rapidly-evolving ICT technologies offer great opportunities and challenges for travel data collection, for example including smartphone data, gaming and simulations.
  - b. Location and other information collected through mobile phones also allow immediate feedbacks to be provided to the respondents, which may prompt them to modify, add to, elaborate, or retract their earlier inputs.
  - c. The interactive process offered by smart phones is unprecedented, allowing us to collect dynamic information about the context and the decision makers' feelings and emotions in real time.
  - d. Smart phones also allow collecting information via different formats: text, voice, picture and video etc.; this capability facilitates the data collection in a more natural way.
  - e. What are the challenges and limitations of the use of ICT technologies for data collection?
7. Use very large volumes of data ("Big Data") and apply them to travel behavior studies.
8. Use virtual and augmented reality for developing/ using games for understanding behavior (e.g. behavioral changes associated with new technologies):
  - a. The use of gaming and simulations has the advantage of designing controlled experiments for behavioral testing and providing us with the opportunity to observe behavior over time.
  - b. How can we test the behavioral impacts of new technologies are not available on the market yet (e.g. autonomous vehicles) through gaming and virtual/augmented reality approaches?

9. Investigate potential of ICTs to developing and deploy reliable and sustainable transportation systems:
  - a. ICT can promote increased reliability and sustainability for various travel modes.
  - b. ICTs have the potential to provide information to travelers also in real-time thus increasing the reliability of travel to all, in particular increasing the perceived utility of public transport
  - c. Use of ICT is increasingly integrated into ticketing and toll charging systems thus allowing dynamic pricing for the sale of travel tickets (e.g. optimizing loading factors and/or revenues for airlines, as well as long-distance buses and trains) or the use of transportation facilities and infrastructure (congestion pricing, bridge tolls, dynamic pricing for parking).
  - d. Similarly for health, a traveler can be notified of how many calories could have been burned if the same trip was taken on foot or by bike, thus affecting mode choice and the adoption/acceptance of sustainable lifestyles.
10. Use of technology to persuade individuals to change their travel behavior toward sustainable travel mode options.
11. Improve the understanding of the adoption of emerging transportation technologies and trends, including the adoption and use of shared mobility services (e.g. fleet-based and peer-to-peer car-sharing, dynamic ridesharing, on-demand ride services/ride-sourcing/transportation network companies such as Uber and Lyft), the recent developments in electronic linked transit fare cards, the use of mobility apps, and the integration of public transit and bike-sharing programs, etc., for example, to better investigate and understand:
  - a. The factors affecting the adoption and frequency of use of various types of shared mobility services;
  - b. Eventual differences in the behaviors and impacts of some factors among various segments of the population;
  - c. Effects of the adoption of shared mobility on activity and travel scheduling;
  - d. Relationships between the adoption of shared mobility, car travel and use of other means of transportation;
  - e. Relationships between the adoption of shared mobility and vehicle ownership;
  - f. The potential integration of TNCs with transit services, to provide last-mile access to transit stations, eventually substitute for routes where demand is too thin, and/or provide a ride home outside of the regular hours of operation of transit services.
12. Improve the understanding of how mobile ICT can improve the performances of different transport services, e.g. reducing wait time and improving service reliability, and therefore change the travel demand for such services.
13. Improve understanding of the revolution brought by the introduction of connected and autonomous vehicles (C/AVs), including:

- a. What factors will affect the conditions and adoption rate of C/AVs?
  - b. What are the expected impacts of AVs on transportation supply and on travel demand?
  - c. What the potential impacts of future vehicle ownership?
  - d. What factors might affect the adoption of shared vs. individually-owned AVs?
  - e. What the impacts on individuals' activity and travel schedules?
  - f. How can we estimate/study the potential impacts on residential location and future land use patterns?
  - g. The task will be coordinated with other TRB committees and other agencies (including the research agenda being developed under the NCHRP 20-102 program on the impact of connected and autonomous vehicles on local transportation agencies: the research committee coordinator serves as a panel member and can act as liaison with the NCHRP activities in this area).
14. Examine the strengths and weaknesses of different data sources for identifying the impact of ICT on travel behavior, e.g. American Time Use Survey, local and targeted surveys, etc.
15. Analyze changes in ICT adoption and use (and impacts on travel) in developing countries, also as mediating factor for closing gaps with previous technological divides (e.g. the adoption of mobile phones and mobile internet connection is nowadays much more ubiquitous also in developing countries than the adoption of computers and home-based internet connections in the past).
16. Establish relationships with non-traditional stakeholders (data vendors, app developers, etc.) and increase cooperation with these parties on research projects (and investigate/stimulate mutual benefits that can make such collaborations more attractive to all parties).

**Appendix B**  
**Diversity Report**

Demographic Committee Profile as of January 2017  
This report does not include (2) Emeritus Members.

Total Members: 19

**A. Describe the membership gender and racial diversity.**

|                            |    | Percentage |
|----------------------------|----|------------|
| White:                     | 8  | 0.42       |
| Black:                     | 1  | 0.05       |
| Hispanic:                  | 1  | 0.05       |
| Asian or Pacific Islander: | 7  | 0.37       |
| American Indian or         | 0  | 0          |
| Unknown:                   | 2  | 0.11       |
| Male:                      | 16 | 0.84       |
| Female:                    | 3  | 0.16       |

**B. How is membership distributed geographically?**

| North West US    | South West US | Central US | North East US | South East US |
|------------------|---------------|------------|---------------|---------------|
| 0                | 3             | 3          | 3             | 4             |
| International: 6 |               |            |               |               |

**C. How is membership distributed across professional affiliation?**

|            |    |                     |   |
|------------|----|---------------------|---|
| State      | 0  | Federal Government: | 0 |
| Education: | 13 | Private Sector:     | 6 |
| Local      | 0  | Nonprofit/Other:    | 0 |