

*Standing Committee on Effects of Information and Communication Technologies (ICT) on Travel Choices (ADB20)
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Information and Communication Technologies (ICT), Activity Decisions, and Travel Choices: 20 years into the Second Millennium and where do we go next?

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ABSTRACT

Information and Communication Technologies, or ICT, have rapidly emerged as an integral element of everyday life, interacting in an essential manner with mobility and the activity patterns that engender it. The current paper reflects upon this trend and the opportunities and challenges it represents. Given more than three decades of research in the domain of interactions between ICT, activity decisions and travel choices, we acknowledge the elaborate, disruptive and often unexpected ways along which ICT interact with society. To support the objective of the ADB20 Committee, namely to support and promote the emerging research questions, we identify a number of technological, societal and behavioral trends related to ICT and mobility that are likely to be major driving forces for activity-travel behavior considerations in the next 15 years. Those include *democratization of technology; personalization; shared and commoditized mobility; automation; data as the new currency; next generation connectivity, including 5G; evolving social media and socialization; new forms of shopping; digital twins; activity fragmentation; and multitasking*. We also observe that inevitably, the increasingly interlocking relationship between ICT and mobility will bring challenges related to balancing *efficiency vs. redundancy and resilience*, ensuring *transparency, susceptibility to malicious activities* and tackling the *digital divide*. We argue that those should not be seen as barriers to realization of the ultimate benefits for society, providing that the transportation research agenda maintains focus on the evolution of ICT and rigorously explores the related impacts on activity decisions, travel choices and, more broadly, on transportation systems.

INTRODUCTION

The turn of the Millennium conveniently coincided with the world entering the era in which information and communication solutions, enabled by modern technologies, started to play an unprecedented role in society – the so-called ‘Information Age’ (a term that appears to have been first used by Richard Leghorn in the early 1960s, according to the Oxford English Dictionary). While the attention of the public started to shift from the unmaterialized fears of the Millennium Bug to the unfolding “Dotcom” (.com) economic downturn, the travel behavior research community fully realized the complexity of the relationships between the effects of Information

and Communication Technologies (ICT) and activity decisions and the consequent travel choices. Consider, in particular, the reflections of Patricia Mokhtarian, then the Chair of A1C08: Committee on Telecommunications and Travel Behavior, the predecessor of the current Committee ADB20: Effects of ICT on Travel Choices of the Transportation Research Board (TRB), at the turn of the Millennium:

‘[...] the so-called information revolution has not been accompanied by a noticeable decrease in travel. Surveys such as the U.S. Nationwide Personal Transportation Study indicate that vehicle distances traveled per capita are growing. Apparently, the relationship between ICT and travel is not simply one of substitution. For researchers who are interested in better understanding travel behavior and for planners and policy makers who need to forecast trends, evaluate alternatives, and possibly influence behavior toward socially desirable ends, it is important to explore this complex relationship further’ (Mokhtarian, 2000, p. 1).

Thus, the complex interactions between transportation systems and ICT have not resulted in the straightforward travel reduction (‘substitution’) that had been seen as an ‘easy win’ by some management and planning agencies. Instead, it has become increasingly apparent that the interactions between ICT and transportation systems typically comprise a blend of some factors that result in the reduction of travel, along with others that facilitate and ultimately increase it or modify its characteristics, such as mode, route or departure time. What followed from this realization was the dawn of an exciting and incredibly fruitful research field, with a strong potential for implementation of results in transportation policy and generation of societal benefits as well as business opportunities.

The centennial anniversary of the Transportation Research Board presents a unique opportunity to reflect upon how ICT solutions have rapidly emerged as an integral element of everyday life, interacting in an essential manner with mobility and the activity patterns that engender it, and the opportunities and challenges this trend represents for the future of transportation. The topic relates to a fundamental question: *where shall we go next as a domain?* It probably contravenes expectations for this sort of exercise to state that this paper aims *not* to answer this question. Instead, it seeks to deliver high-level reflections on the interpretations of the term ICT in the context of research on travel choices and on the role of ICT as an underlying enabler of disruption to some long-established transportation dogmas, as well as to critically look at some of the risks associated with the growing role of ICT in transportation. We hope that this paper will provide a concise stimulus for the continuing critical thinking of engaged scholars and policy makers, and will motivate transportation research in the upcoming years¹.

THE ELUSIVE NATURE OF ICT

As a concept, the term Information and Communication Technologies² appears to have entered the broader scientific discourse in the 1980s, having evolved from earlier concepts of computer,

¹ Due to the nature of the paper and restrictions on its overall size, the authors decided to largely refrain from providing references to specific studies when discussing particular research areas. Authors acknowledge, however, drawing upon the very large number of studies that the ICT, activity decisions and travel choices domain has amassed over the years.

² An alternative version, Information and Communication Technology, is sometimes used for the acronym ICT. In the present context, we use the plural version to emphasize the meaning of the term as encompassing a variety of technologies.

communication and information technologies, e.g., Benjamin et al. (1983), to emphasize the increasingly tight coupling between the ability to process and transmit information and the emerging computing and telecommunications technologies. In particular, on the technology side computing (information processing) and telecommunications (telephony) started converging when communications were becoming increasingly digital in the late 1970s and early 1980s. This period also saw the emergence of the Internet's predecessors. Thus, computing became essential for telecommunications at that time and the convergence between the two became a phenomenon in the 1980s, signaling the necessity to move from 'IT' towards 'ICT'.

A particularly important disruption in the ICT sector came with the emergence of *mobile* ICT. The shift from stationary ICT (desktops, fixed line telephony) to portable computers (laptops) and, more recently, the broader array of smart mobile devices (smartphones, tablet computers, wearable technologies), accompanied and enabled by the mobile broadband Internet and location capabilities, have been arguably the single most important ICT development in relation to transportation and travel. Not only have mobile ICT enabled new ways of conducting activities, accessing information or making travel choices, but they have also resulted in entirely new approaches to transportation analysis, using the data generated through operation of mobile ICT systems.

Numerous views on the scope of ICT relationships with travel have been put forth in our community since then, perhaps revealing underlying currents in the transportation domain as a whole on the one hand, but also evolution in the interests of the involved researchers on the other. Table 1 contains a summary of the key research questions presented as part of past Calls for Papers of the ADB20 Committee, revealing the many different angles the research community has sought to explore, both methodologically and through empirical applications, narrowed to particular contexts or seeking generality, eventually focusing on particular technologies or socio-economic groups. What this clearly highlights is that research on ICT, activity decisions and travel choices has matured, as in most cases the research questions have seen responses through various studies that attempted to address them. Yet it is here that the ephemeral nature of ICT reveals itself, in the form of a question: to what extent can frameworks and research findings from the past two decades still inform and still offer guidance related to today's impacts of ICT?

Considering the confidence in the continuing evolution and growth in functionalities of ICT accompanied by their integral role in everyday lives, it warrants a critical reflection on how best to ensure that any outcomes from research concerning interactions between ICT, activity decisions and travel choices can retain relevance in the future, and not be vulnerable to the obsolescence of particular technologies. Consider, for example, that the Salomon and Mokhtarian taxonomy of interactions between ICT, activities and travel (substitution, complementarity and generation, modification, neutrality) is as relevant today as it was when it was devised in the late 1980s and early 1990s (Mokhtarian, 1990; Salomon, 1986). While the original framework has evolved (Mokhtarian et al., 2006; Circella & Mokhtarian, 2017) and the manifestations of particular interactions might have changed over the years, the temporal stability and confidence of the conceptual core is crucial to provide effective recommendations to planners in terms of addressing both the immediate operational and management challenges (e.g., congestion, safety, air quality) as well as long term, strategic decisions (e.g., infrastructure investment).

A potential way forward could see the examination of approaches in other disciplines, such as marketing or thermodynamics, where the elusiveness of the examined subjects is taken

as a starting point for further investigation. In addition, studies should more readily move beyond reporting purely the empirical, context -specific insights, and seek to consolidate knowledge by forming, validating and enhancing theories that ultimately would be transferable across temporal and spatial contexts.

Table 1: Key research questions in the past calls for papers from the TRB ADB20 Standing Committee on Effects of ICT on Travel Choices

Year	Research questions
2000 Millennium Paper	<ul style="list-style-type: none"> • <i>Substitution versus Complementarity</i>: How do multiple effects combine to produce an observed net outcome? Understanding of the full range of influences on the travel and communication choices individuals make, which may affect the utility of the alternatives in less obvious ways. • <i>Mobile and Self-Employed Workers</i>: How extensive is mobile work? Does it affect the typical office worker, or mainly the high-level executives and professionals who project their own experiences and see a revolution? Can different types of mobile and self-employed workers be identified, with an assessment of the size and growth trend of each category? How do the effects on transportation, both local and long-distance, differ by category? • <i>Tele-shopping and e-commerce</i>: What kinds of people engage in teleshopping, how often, for what kinds of goods, and under what circumstances? To what extent does teleshopping replace or supplement store shopping, and how does that vary by the factors just mentioned? What are the impacts on travel, including net travel effects, impacts on supply or business implications? • <i>Spatial impacts</i>: impacts of telecommunications on office location and urban form; residential location choices and real-estate market implications; commerce implications; broader causality attribution.
2001 Call for Papers	<ul style="list-style-type: none"> • The personal travel behavior implications of Internet shopping, electronic messaging, cellular telephones, teleworking, teleconferencing, distance learning, or other telecommunications applications. • Experience with promoting telecommuting or other travel-saving telecommunications applications as a travel demand management strategy. • Research from the established topic of media choice (e-mail versus phone calls versus meetings) that bears directly on travel behavior.
2004 ABD20 Call for Papers	<ul style="list-style-type: none"> • The extent to which people use information and communications technology (ICT); • The extent to which ICT has altered time use and activity patterns; • Whether ICT serves as a substitute or complement for travel; • How ICT shapes people’s attitudes, perceptions, and values with respect to travel and congestion; • How people use ICT to accomplish activities.

2012 ADB20 Call for Papers	<ul style="list-style-type: none"> • Adoption and usage of ICTs by different socio-economic segments: Who are the early adopters? What devices are owned? How and when are they used? • Mobile technologies, en-route guidance, and travel behavior: Dynamic route guidance, transit wait-time information, subscription to and use of such services. • Influence of social media on leisure, social interactions and overall time use patterns: Use of social media, influence on leisure/social travel, impacts on other aspects of time use such as in-home activity duration.
2014 ADB20 Call for Papers	<ul style="list-style-type: none"> • How to use big data sources to better understand composite activity and travel patterns; • Examples of forecasting models that have been developed from such data; • How to use mobile ICTs as tools for influencing people's travel behavior e.g., to encourage sustainable mobility choices or reduce congestion; • Analysis of self-selection bias arising from the possible non-representativeness of big data samples (such as cell phone usage data not being evenly distributed across all population groups).
2019 ADB20 Call for Papers	<ul style="list-style-type: none"> • Modeling frameworks and analysis methods for understanding the use of ICT and travel across generations, such as cohort analysis; • Adoption of new transportation services (e.g., shared mobility) and mobility “on demand” across various cohorts, sociodemographic groups, and in various urban contexts; • The use of social media, crowdsourcing, and other methods for collecting empirical data for understanding travel and related activities, such as socialization; • Adoption of mobile Information and Communication Technology (ICT) within segments; • Behavioral models of traveler responses to ICT and emerging ICT-enabled services, especially with respect to facilitating multimodal trip-making; • Impacts of ICT on traveler experiences, trip planning and trip adjustment.

Source: Mokhtarian (2000), Srinivasan (2014), ADB20 Committee (2018a).

ICT AS ONGOING ENABLER OF DISRUPTIVE TRENDS IN TRANSPORTATION

The initial research approaches to the topic of ICT and travel behavior have been primarily oriented at the direct impacts on transportation demand. The early expectation was that transportation systems would be disrupted through proliferation of substitution and complementarity between telecommunications and travel. It turned out, however, over the past 20 years that ICT interact with transportation systems in much more elaborate, though no less

fundamental ways, often disrupting long-established transportation patterns and dogmas. Consider the following examples:

- *Car ownership*, once seen as the pinnacle of private mobility freedom, has been put into question by emergence of the variety of ICT-facilitated (mobile broadband, satellite positioning) sharing and hailing services (including various forms of vehicle-sharing, ridesharing and ridehailing). The trend has seen a disentanglement between car travel and its ownership, leading to the emergence of new transportation alternatives, superseding the previous status quo dominated by the triad of public transport, private car and active modes (walking and bicycling).
- *Vehicle automation and connectedness* have been enabled by the advancement in the embedded ICT, with implications for transportation supply and operations as well as travel behavior. Although the contributions of ICT to more efficient transportation supply and operations have long been acknowledged (conventionally under the umbrella term of Intelligent Transport Systems, or ITS), those direct impacts have been considered outside the scope of ADB20. The resulting reduction in the effective cost of travel, however, has implications for travel choices that are within scope. From the travel behavior perspective, at full maturity the vehicle automation enabled by the embedded ICT permits richer uses of travel time, accompanied by ethical and legal challenges resulting from the vehicle's operational decision-making being put into the digital hands of on-board algorithms.
- *Big data* were in the past the rather exclusive domain of the aforementioned Intelligent Transport Systems, purposefully designed to collect and analyze information concerning transportation systems. More recently, however, the transportation domain has learnt to make use of data derived from the broader range of ICT, including personal devices, online services (shopping, social media, and web traffic), sensors or ICT solutions embedded in various infrastructure types. Thus, what were in the past the seeming by-products of ICT use have become extremely potent sources of opportunistic data for transportation analysis. The extent of that phenomenon is also captured by the perception of data as 'the new oil', i.e. source of value. Transportation systems operators and other stakeholders have found themselves increasingly owning a very valuable asset, which opens new ways of managing as well as financing transportation services.
- *Virtual and augmented reality* have created a new sphere for research associated with how people interact with transportation systems. The emerging ways of interacting with travelers (provision of information, data collection exercises, public consultation), conducting activities or delivering services have arguably become less dependent on physical infrastructure.
- *Machine-to-machine (M2M) interactions* have been enabled by ICT, giving rise to the concept of the Internet of Things (IOT). Just as ICT provided a means for humans to communicate between each other or access resources (information, services) remotely, this is now increasingly the case for machines. M2M interactions have profound implications for delivery of transportation services, ranging from connected vehicles to dynamic infrastructure management to ensuring safety by automated incident identification and response mechanisms. More importantly from the ADB20 perspective, M2M interactions have impacted ways in which activities are undertaken, affecting the consequent travel choices. Consider for example that an online shopping order initiates a whole set of M2M interactions within automated shopping and warehousing centers,

processing the orders regardless of time of day or, for that matter, location of the shopper. When compared with the requirement for a physical trip to a store during its opening hours, the example demonstrates the far-reaching impacts M2M interactions can have in terms of enabling back ends of the activities.

- The *nature of (travel) time* has been profoundly shaped by technologies enriching ways of using time, especially what was previously seen as ‘wasted’ travel time in conventional transportation analysis. Similarly, the multitasking phenomena of sequential (spatial and temporal fragmentation) or simultaneous performance of multiple activities have been shown to be associated with the growing use and capabilities of ICT, even though the links have been notoriously intricate. The consequence has been an increased pressure to refine the approaches for transportation infrastructure investment appraisal, which are largely oriented towards the evaluation of travel time savings. Specifically, there is a growing realization that such appraisals should shift towards more comprehensive ways of measuring the economic, social and environmental impacts of transportation investments, especially considering the emerging ways of using ICT solutions.

By no means is the list above exhaustive, but only serves to demonstrate the depth as well as the pace at which the interactions between ICT and travel can occur and the complex ways in which they may affect travel choices. Nonetheless, it is comforting to observe that the research community looking at those disruptions is abundant which provides a further acknowledgment to importance of those issues and also warrants the continuing efforts seeking to understand the effects of ICT on activity decisions and travel choices. To that end, the key objective of the ADB20 committee has been to support and promote those emerging research questions in its calls for papers as well as its Triennial Strategic Plan (ADB20 Committee, 2018b).

THE NEAR FUTURE OUTLOOK

Acknowledging the uncertain trajectories along which ICT may evolve and interact with society, we here list a blend of several technological, societal and behavioral trends related to ICT and mobility that, in our opinion, have the potential to become major driving forces for activity-travel behavior considerations in the near future, i.e. in the next 15 years:

1. *Democratization of technology* refers to the widespread adoption and access to various forms of ICT and other technology, including smart devices, connectivity, and domotics as well as services enabled thereby. As an example, consider that any user with an Internet-enabled device is now capable of accessing mapping and travel planning services with global coverage, multi-modal information overlay and real-time service and congestion updates, e.g., Google Maps.
2. *Personalization* is a trend which sees various services and products, including those related to mobility (e.g., information, travel and activity options and offerings, vehicle configurations), tailored to user attributes and preferences and the contexts in which they operate. Personalization capabilities have evolved from requiring explicit user inputs (selecting options) to embrace and draw upon various data streams that implicitly capture user behavior. Such data are subsequently processed, often using sophisticated econometric and machine learning techniques to profile the user and provide the best-matching personalized offering.
3. *Shared and commoditized mobility* has been a creeping revolution over the past ten years, fueled to a substantial extent by the increased capabilities of ICT in general, and

smartphones in particular. The sharing of rides or vehicles and/or delivering “Mobility as a Service” (MaaS) present new challenges not only to researchers, but even more so to transportation system operators and investors.

4. *Automation*, while not completely absent from transportation in previous decades (e.g., automated light rail, aircraft autopilot technologies), is and will be an increasingly common feature of passenger and commercial vehicles, with the end goal of achieving full autonomy (‘driverless cars’) in the medium-term horizon. Automation also includes a broader range of unmanned vehicles, most prominently those airborne (drones, and potentially air taxis).
5. *Data as the new currency* is recognition that ICT are responsible for producing a plethora of opportunistic data (also termed ‘digital exhaust’) that is increasingly deemed valuable. These mobility data are particularly valuable as they allow new business opportunities (not only in the transportation sector) as well as improved operation of transportation infrastructure. In this sense, the interaction of ICT with mobility can be seen as a means of value creation for the end user, as well as the service operator, through establishing ways in which this takes place transparently (though protecting users’ privacy and acquiring user consent remain ongoing issues globally).
6. *Next generation connectivity, including 5G*, is expected to increase bandwidth/speeds, reduce latency, ensure reliability and omnipresence, and allow many more devices to be connected. This unprecedented capability to share information will not only affect ways in which time is spent (through enhanced or entirely new digital activities) but it also provides a means for new mobility services.
7. *Evolving social media and socialization* signify the growing demand for a richer experience related to social interactions by means of ICT. Among other modifications, messaging and picture-sharing functionalities are gradually evolving into sophisticated multimedia sharing platforms, with versatile content creation tools and means of engaging in joint activities (also in physical reality, via communities of interests, events, etc.).
8. *New forms of shopping* embrace the ability to select and purchase items online, but they also continue the de-materialization of certain products and goods, e.g., books, music, which turn into digital content that is easily delivered electronically. As more and more shopping is undertaken online, travel patterns related to shopping have already changed, and will further change in the future. So will supply chains. This may be further fueled by fast delivery solutions, including automated delivery systems (drones or last-mile delivery robots), localized production (using 3D printing) and (eventual) societal attitudes towards sharing and reusing instead of buying.
9. *Digital twins* refer to digital (simulated) environments that mimic completely the behavior of the actual systems, allowing the testing of policies and strategies in the same form as would be deployed in the corresponding real-world system. The term also includes digital counterparts of the users, capable of interacting with suitable systems. Such interactions may involve acting on behalf of the user, e.g., initiating shopping, or making decisions regarding travel arrangements, thus effectively emulating (or possibly enhancing) human behaviors. Implications for mobility are likely to be substantial, though still largely uncertain in their nature.
10. *Activity fragmentation* remains an issue often associated with the proliferation of ICT. The phenomenon is likely to continue, fueled by the growth of the ‘gig economy’ and the

increased flexibility in the ways in which people can switch between activities, and more conveniently choose how their time is allocated among competing needs.

11. *Multitasking* refers to the conduct of multiple activities 'at once', i.e. simultaneously, or sequentially within the time unit of interest³. With respect to mobility, it has been best recognized in the form of travel-based multitasking, or activities conducted while traveling. Similar to the way the proliferation of mobile ICT allows flexible, remote participation in activities, it also often allows simultaneous digital activities (some of which can be run 'in the background'). The necessity to reflect this trend in activity-travel behavior models appears to become more and more urgent.

Not surprisingly, several of the above topics tend to be related to each other or sometimes overlap. For example, next generation connectivity provides mechanisms that enable new mobility services or vehicle automation, which in turn expand the opportunities for travel-based multitasking. Accordingly, this near future outlook is non-exhaustive. It will hopefully stimulate constructive discussion highlighting other areas of vital importance in this research arena, and serve to motivate and structure some research directions of the ADB20 community.

CRITICAL PERSPECTIVES ON THE GROWING ROLE OF ICT IN TRAVEL CHOICES

The ADB20 Committee has a mandate to maintain a critical and reflective approach to continuously updating its research agenda and to navigating the future of transportation research in a fast-moving world characterized by new technological applications and changing societal trends. Moving forward, we observe it also faces a number of challenges associated with the undoubtedly growing role of ICT in transportation systems. These include the following:

- *Efficiency versus redundancy and resilience* has become one of the critical considerations for modern transportation systems. Efficiency gains have been achieved by means of ICT, and yet the efficiencies have often been delivered at the expense of redundancy, i.e. spare capacity of various sorts, as well as an increased dependency on the reliability of ICT systems. This naturally raises the question of resilience of such systems, both in terms of responding to conditions of increased demand or reduced supply, and in terms of disruption in ICT systems themselves, given the reliance on utilities or deep technical expertise. The associated possibility of cascade effects, in which a disruption in one infrastructure rapidly leads to a disruption in another, requires careful consideration. Some recent catastrophic events ignited by a natural disaster that prompted a failure in power plant and the electricity grid, which cascaded into complete shutdown of cell phone networks and other communication networks, remind us of the vulnerability of a modern ICT-dependent society (and when electric and connected vehicles will dominate the market, similar failures might affect the transportation system). In particular, it warrants that policies and investments are shaped so as to maximize the opportunities for infrastructures' complementarity: consider for example the potential of ICT to enable remote participation in activities during periods of transportation disruptions or the ability to encourage local peer-to-peer services or pooling, leading to reduced vehicle travel demand.

³ For example, sequentially working on two research projects in the course of a day could be considered doing two projects "at once" from the time frame of a fiscal year.

- *Transparency* in ICT systems has been discussed at different levels, ranging from issues of privacy, to user data processing (both explicit user data as well as the implicitly generated ‘digital footprints’ or ‘data fumes’), to tractability of the decision processes assisted by machine learning or artificial intelligence, which often operate as ‘black boxes’. In the age where ICT have enabled increased participation of people in initiatives, leveraging social media or e-government services, the use of ICT in transportation systems should involve the utmost transparency to ensure continuing user trust.
- *Susceptibility to malicious activities* is a related concept to that of transparency. Concerned critics of ICT proliferation tend to highlight how the dependence of transportation systems on ICT opens other opportunities for human-caused disruptions, by means of cyberattacks. Similarly, exploitation of the ability of transportation systems to gather a plethora of user data, digital footprints and data fumes for malicious purposes (sensitive data theft, identity theft, spear-phishing) has to be recognized as a growing potential threat in the same way that the risk of traffic injuries and fatalities increased with vehicle speeds and traffic volumes over the past decades.
- The *digital divide* remains and is likely to remain a substantial issue, in which parts of society (demarcated along sociodemographic or geographical boundaries) are excluded from the benefits of ICT, either due to their lack of suitable skills or misaligned investments.

Further, one final challenge remains, the one that has prevailed in the field since its very beginning: the unpredictable and often elaborate impacts that ICT have on activity decisions and travel choices. This should be clearly distinguished from developments in the ICT themselves which follow technological multi-year technological roadmaps, and are therefore more foreseeable. From this observation follows a recommendation to the ADB20 community to remain closely aligned with ICT sector research and industry developments, e.g., Institute of Electrical and Electronics Engineers (IEEE), Internet Engineering Task Force (IETF), GSM Association (GSMA), to be the first layer that rigorously explores the possible interactions of emerging ICT with activity decisions and travel choices.

CONCLUSIONS AND NEXT STEPS

The past decades have seen an increasing coupling between ICT and mobility, which has been evidenced by, for instance, the growth in TRB committees oriented toward ICT-enabled components of transportation systems. The integration between ICT and transportation systems has brought substantial gains to society, by facilitating activity participation and new forms of mobility, or by making transportation systems operation more efficient through ITS. The current trajectories point toward a future with an ever-increasing role of ICT in both of those respects – transportation demand and supply. Inevitably, this growing convergence between ICT and mobility, often at a pace far exceeding the traditional multi-decade perspective of transportation planning and engineering, will bring challenges and uncertainties. Those should not, however, prevent realization of the opportunities and ultimately benefits from the interactions between ICT, activities and mobility, of which there is a record of accomplishment spanning more than three decades. It is arguably now, at the brink of the centennial anniversary of the Transportation Research Board, that the transportation research agenda needs an increased focus on the dynamic changes in the ICT world and the related impacts on activity decisions, travel choices and, more broadly, on transportation. In addition, the ICT proliferation has brought new stakeholders into transportation planning and expanded its delivery scope, previously dominated by planning

agencies, municipalities, publicly-owned operators, consultants, and academics. These new players do not always follow the previously established practices and norms, and thus are seen as ‘disruptors’. Yet they are becoming a feature of the evolving transportation landscape and an engine of change for society. Hence, they require inclusion in the discourse. Maintaining and promoting the research focus while also facilitating the discussion between traditional transportation professionals and emerging stakeholders should be part of the ADB20 community’s continuing effort to expand its impressive, multi-disciplinary scientific track record and real-world impact.

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